THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. AUGUST 13, 1896. CHICAGO, ILL. NUMBER 33.

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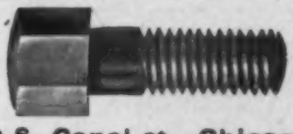

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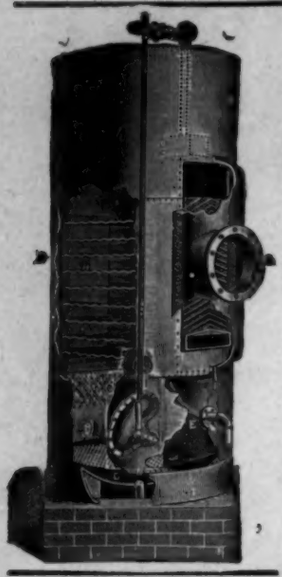

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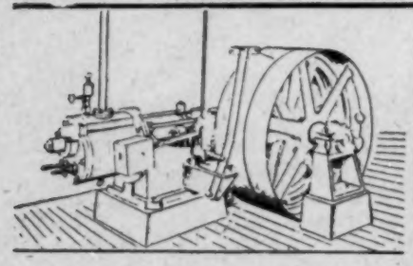

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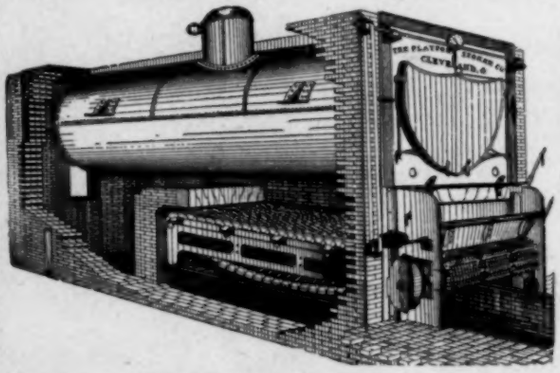

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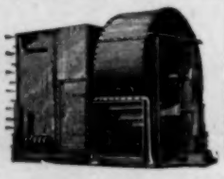

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. AUGUST 13, 1896. CHICAGO, ILL. NUMBER 33.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

In no department of the iron trade is there a belief that anything but the expected will happen between now and Nov. 3, and this unanimity guarantees a monotonous market. The exceptional buyer, who considers that any increase of the strain on general business will be measurably offset, so far as iron is concerned, by curtailed production and the reduction of stocks, is accepting some of the low offers current, figuring that if sound money wins, there will be an immediate advance, and that in the other event, the iron if held long enough will have a higher price in terms of free coinage dollars. The rule is, however, that only present wants are supplied. And sellers for the most part have no disposition to push for business that involves extended deliveries. The difficulties of collections and the uncertain outcome of the policy of loan curtailment pursued by some of the banks, makes many chary of selling. In ordinary times such a blowing out and banking of furnaces as has been seen in the past six weeks would be reflected in the market, but statements of production and of stocks on hand have little weight just now. The necessity of riasing money has been making the price on a good deal of the pig iron recently sold, and cost has been disregarded on some few transactions in Bessemer at Pittsburg. On one lot $10.40, Pittsburg, was touched, an uncomfortably close approach to the low basis of December, 1894. Southern irons have been offered at prices quite as low, in some cases, as in 1894, and at the moment there seems to be no well defined bottom. Northern producers of foundry irons have been getting out of blast. All have stocks that will take care of orders in the next few weeks, and some of them anticipate very advantageous purchases of non-Bessemer ores in the next two months. The coke industry is feeling the furnace suspensions keenly, and the expectation of a redcution in the price of Connellsville coke is more than likely to be realized. Prices on finished material are sagging and plates, angles and bars are sold below quotations. Few mills are able to make a week's schedule and outside of the large Brooklyn order for plates there have been practically no important contracts up of late. For the Boston Subway 700 tons of material has been taken by Pittsburg. The decision to use plates on the Brooklyn work was a grievious disappointment to cast iron pipe works, none of which are well fixed with orders, while those on hand were taken at prices giving the barest profit.

THE CLEVELAND DISTRICT.

The embargo laid on ore buying by the existing situation in furnace districts could scarcely be more complete. Now and then the possibility of a break in ore prices is broached in newspaper gossip, but so far as Bessemer ores are concerned there is no expectation, even among buyers, that existing conditions will have any such outcome. The bulk of ores of that class that will be needed before May 1, has been taken in purchases so far made, and there is too much at stake with producers to permit of any break at this juncture. Non-Bessemer ores have receded from the basis of the early part of the season, but have not gone to the extent of demoralization, because not enough has been bought of late to give a chance even for spirited cutting. Each week shortens up the production of ore by the laying off of miners, and boats are finding ore cargoes scarcer and scarcer. The rates are still 60 and 50 and 40 cents from Duluth, Marquette and Escanaba, respectively. The new Lake Superior & Ishpeming Railway opened its docks near Marquette this week, and the first cargo was Cleveland-Cliffs ore, taken by the Pioneer.

Pig Iron. There is one striking difference between the present situation in pig iron and that in the panic of 1893. Three years ago it was possible to realize on iron at some price, purchasers being ready to take iron offered at a sacrifice; but today it is well-nigh impossible to dispose of iron at any price. In foundry grades there is a certain amount of buying from week to week, but foundries are running with small forces, and a 500-ton contract is exceedingly rare and sharply competed for. Some furnaces are maintaining $11 in the valley for No. 2 foundry, but in other instances this price will command No. 1 and there is much irregularity in the market. Only one furnace producing foundry iron is now active in the valleys, but stocks are ample. Besemer has sold at very low prices in one or two instances $10 at valley furnace having been cut. We quote Cleveland prices:

Bessemer	$11 50@11 75	Valley Scotch No. 1	$12 00
No. 1 Strong Foundry	11 75@12 00	Valley Scotch No. 2	11 50
No. 2 Strong Foundry	11 25@11 50	Gray Forge	9 50@10 00
No. 3 Foundry	10 25@10 50	Lake Superior Charcoal	13 50

Finished Material. In some lines the small-lot busines of the week has amounted to a fair tonnage. In bars, in merchant steel and in wire, country dealers have been carrying very little stock, and orders from them, though small, have been steady. Quotations by Pittsburg mills on bar iron have gone below the combination price in territory tributary to valley mills, and the latter have made competitive prices in districts not covered by the agreement. Plates and angles are weak. On universal plates 1.15c Pittsburg, has been done, and angles are delivered in Cleveland at 1.20c. We quote beams and channels at 1.65c; steel bars, 1.15c to 1.20c; bar iron, 1.20. The consumption of steel in the wire and wire nail mills of Cleveland, that buy their own billets or rods, is very light. The H-P Nail Co. is operating with a very small force in its nail department, the spike trade furnishing the largest demand. The rod mill is shut down and will be idle indefinitely. The American Wire Co. has a fairly full force in its wire drawing department and one rod mill is in operation. This company is about to begin the manufacture of wire nails, having installed a number of machines, with others to follow. It has no connection with the nail pool. The Consolidated Steel & Wire Co.'s plant is inactive. The rod mill started some weeks ago, but the men objected to the wage basis and a shut down was promptly ordered. The market for scrap seems to be without bottom. There is little taken by mills but some speculative buying is reported, where attractive bargains can be had.

CHICAGO.

OFFICE OF *The Iron Trade Review*, 1142 MONADNOCK BLOCK, Aug. 12.

There is almost nothing new to report this week, as in only one branch of the market have there been any sales of particularly large size. The largest malleable interest purchased several thousand tons of pig iron last week, and one other round lot was disposed of. Buyers as a rule do not seem inclined to take hold of the market with any interest, but make only such purchases as are absolutely necessary for the continuance of their operations. Here and there one is found who is convinced that prices are nearly if not quite at the bottom and who consequently is willing to secure material for some time ahead. Nearly every one is more interested in the political contest than in business, and it is surprising to see how many business firms that have never before taken any active interest in politics are making every effort in their power to assure the success of sound money. A great many of the large business houses and banks are sending out literature pertaining to the money question, and the avidity with which the documents are sought for and read by the common people argues well for their intelligence and for the overtaking of the fallacies and mis-statements that have characterized the free silver campaign.

PIG IRON.—The business closed last week included a sale of something over 10,000 tons of Northern iron to the largest malleable interest. A sale was also made of 1,000 tons of Southern iron. Aside from these, business was only in small lots, and it does not appear that there are any very large inquiries in the market at present. Most buyers have not the courage to make purchases for any long time ahead under the existing political conditions. It is hardly likely that any great amount of buying will be done between now and November. The result of this is likely to be heavy purchases of iron very soon after election, if the decision is for sound money; and if in the meantime furnaces continue to go out of blast as rapidly as they have been doing of late, it is doubtful if there will be sufficient capacity active at that time to supply the demand. It is not expected that prices will be very much lower than they are at present between now and November. These things considered, the buyer who purchases round lots of iron at the present prices and with the favorable terms which he is now able to secure, will make a considerably better deal, it is argued, than the one who puts of buying until after election. In the event that free coinage wins at the polls, this reasoning may not hold good. It comes, therefore, to a question of judgment as to who will win at the elections. In the last week prices have been inclined to recede a trifle and our quotations are corrected accordingly. There has been some talk of reductions in Southern freight rates, but the latest information is that none will be made at the present time. Quotations are as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$10 60@10 85
Local Coke Fdy. No. 1	11 75@12 00	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	11 25@11 75	South'n Silveries No 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@11 25	Jackson Co. Silveries	14 5 @16 00
Local Scotch Fdy. No. 1	11 75@12 00	Ohio Silveries No 1	15 00@15 50
Local Scotch Fdy. No. 2	11 25@11 75	Ohio Silveries No. 2	14 5 @15 00
Local Scotch Fdy. No. 3	11 00@11 25	Ohio Strong Soften rs	15 00@15 50
South'n Coke No. 1	11 00@11 35	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	10 6 @10 85	Malleable Bessemer	1 : 25@12 50
South'n Coke No. 3	10 35@10 60	Coke Bessemer	13 00@13 50
Southern No. 1 Soft	10 60@10 85		

BAR IRON.—The market was very quiet last week andno large business was closed. What small orders were taken went at the regular prices which are as follows: Common iron, 1.30c to 1.35c; guaranteed, 1.35c to 1.40c soft steel bars from strictly billet stock, 1.30c to 1.35c.

RAILS AND TRACK SUPPLIES.—There continues to be a very good demand for rails in small lots, and it is thought that the local mills can be kept busy until the end of the year. Quotations are made as follows: Rails, $29; splice bars, 1.35c to 1.50c; track bolts with square nuts, 2c to 2.10c; hexagon nuts, 2.10c to 2.20c; spikes, 1.77½c to 1.80c.

BILLETS AND RODS.—Orders are confined to a few small lots, and the outlook is not good for an increase in the demand very soon. Quotations for billets are continued at $21.25.

STRUCTURAL MATERIAL.—Bids have been asked for the material for the new building of the Illinois Trust and Savings Bank, requiring about 700 tons. Aside from this very little business has been closed and the inquiry is light. Quotations are as follows: Beams and channels, 1.70c to 1.75c; angles, 1.35c to 1.40c; plates, 1.40c to 1.45c; tees, 1.55c to 1.60c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Only a few small orders were taken last week and there is no business of importance in sight for the immediate future. Quotations are unchanged as follows: Tank steel, 1.40c to 1.45c; flange steel, 1.60c to 1.65; fire-box steel, 2.15c to 5c; boiler tubes, 70 to 75 per cent discount.

SHEETS.—Orders were small and scarce last week, and the current demand is so light as to indicate only a small business for the next two weeks. Quotations are now made at 2.20c for No. 27 black and 80 and 2½ per cent discount on galvanized.

MERCHANT STEEL.—Current business is very light and is confined to small lots. Only a few orders for mill shipments have been had, the bulk of the business going being from store. Quotations are as follows: Open-hearth, spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD RAILS AND WHEELS.—Business was very light last week, being confined to a few small orders. Prices are only nominal. They are made as follows: Old wheels, $12.50 to $13.50; old iron rails, $13 to $13.50; old steel rails, $9.50 to $10.

SCRAP.—The few transactions that were closed last week were for small lots. Dealers are not looking for an increase in business in the immediate future. The following are buying quotations furnished by dealers: Railroad forge, $10 to $10.50; dealers forge, $9 to $9.50; No. 1 mill, $7; heavy cast, gross ton, $8.50 to $9; malleable cast, $8.50 to $9; axles, $14.50; cast borings, $3.50; wrought turnings, $4.25; axle turnings, $6.25; mixed steel, $7.25; stove plates, $6; heavy melting steel, $8.50 to $9.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 807 TRADESMEN'S BUILDING, Aug. 12.

With money tighter the situation is somewhat more strained this week. Last week's record of low prices for Bessemer has been met and passed and where sales had to be made figures considerably below $11, Pittsburg, have prevailed. At some valley furnaces the reduction of wages has been accepted and work continues. The Brooklyn plate order, so long talked of, has finally come to Pittsburg, also an Eastern order for structural shapes. Other conditions are a repetition of former weeks.

PIG IRON.—With but five furnaces active in the two valleys (including two in Columbiana county, O.), the adjustment to the slack demand is being rapidly made. Owing to extreme tightness of money some very low figures have prevailed, going even below last week's low water mark. A lot of 1,000 tons is said to have gone at $10.40 Pittsburg, for spot shipment, and other reports of low figures are heard. All transactions of the week have been dominated by monetary conditions and prevailing prices could not touch average stocks in the hands of makers, not under the necessity of realizing. These are

held about as quoted below. Foundry and gray forge have not moved in the week. We quote:

Bessemer	$11.25 to $11.75
No. 1 Foundry	11.75 to 12.25
No. 2 Foundry	11.25 to 11.50
Gray Forge	9 50 to 10 00

BILLETS.—There are offers of small lots at $19.75 to $20 but steel is unsought and practicably unsalable. Cheap billets have been stocked by some middlemen and may be obtained for some time, if the present low rate of consumption continues. Transactions during the week have been very meager.

STRUCTURAL MATERIAL.—With only about one-third of the tonnage now booked that was ahead of the mills at this time last year, local mills are only moderately occupied and current inquiry holds out little encouragement for the future. Some fair contracts have recently been taken, among them another section of the Boston Subway, involving 690 tons of material. In the absence of more welcome news curiosity is aroused by the reported shading of agreed rates on beams and channels. Universal plates and angles are on the decline again, the former holding at 1.15 to 1.20c and the latter at 1.20c. Beams and channels are quoted at 1.55c; tees, 1.40 to 1.45; zees, 1.30c to 1.35c.

BARS.—Only immediate requirements in bars are being met and these fail to occupy mills, necessitating very irregular schedules. We continue to quote: All muck bar iron, 1.20c to 1.25c; common, 1.10c to 1.15c; Cleveland and Youngstown, 1.20c; steel bars, 1.10c to 1.15c.

PLATES.—As anticipated last week the Brooklyn order was taken by the leading local interest. The tonnage is given as 12,000 to 13,000. General trade is weaker and lower prices prevail. In several instances 1.20 has been shaded and an order of 300 tons 1.15 was named. New business is scarce and brings out lively competition. We quote: Tank 1.20c to 1.25c; shell, 1.30c to 1.35c; flange, 1.45 to 1.50.

SHEETS.—The situation in sheets is somewhat better and the week has brought several transactions of a limited size. Prices are weak and the following quotations have been shaded: No. 26, 2c; No. 27, 2.05c to 2.10c; No. 28, 2.10c to 2.15.

WROUGHT PIPE.—Actual wants of dealers have created some business in the week but buying is very conservative and the total is small. Five 10's and 5 per cent is the prevailing discount.

OLD MATERIAL.—Relaying rails are still in demand but are difficult to find. In all other lines the market is absolutely dead. We continue quotations: No. 1 wrought scrap, $12 net; cast scrap, $10; hammered iron axles, $18 to $18.50; rolled iron axles, $16 to $16.50; heavy melting stock, $11 to $11.50 coil springs, $13; old iron rails, $15.75 to $16; steel rails, $11 to $11.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. With the exception of two or three fair sized orders, but little business has been done in the central district during the past week. An inquiry for 500 tons at Columbus, O., brought out nine competitors. This represents the eagerness of sellers and scarcity of buyers. Prices for Southern irons remain nominally the same, but lower figures can be obtained by gilt-edged buyers, especially if they will take early delivery. Requests to hold up shipments, to grant extension in time of payments and to renew notes are uncomfortably frequent. There is no change to be reported in charcoal brands. Business is very quiet, although considerable Lake Superior charcoal iron is going by the lake on orders previously booked. It is stated that during the month of July about three-fourths of the current output of Lake Superior charcoal furnaces was disposed of. The following are current quotations but they have been shaded. Prices have a rather wide range, some sellers making figures that would not be entertained by others. A sale of foundry forge is reported that shaded $5.75, Birmingham, considerably, and a sale of 1,000 tons of No. 2 foundry was made at $6.50, Birmingham. We quote: Southern coke No. 1, $10; No. 2, $9.25 to $9.75; No. 1 soft, $9.25 to $9.75; Lake Superior coke, No. 1, $12 to $12.50; No. 2, $11.50 to $12; Hanging Rock charcoal, No. 1, $15.50 to $16.50; Tennessess charcoal, No. 1, $13 to $14; Jackson county silvery, No. 1, $13.50 to $14; Southern coke, gray forge, $8.75 to $9; mottled, $9; standard Alabama car wheel, $14.75 to $15.50; Tennessee car wheel, $13.50 to $14.50; Lake Superior car wheel, and malleable, $14.75 to $15.25.

Philadelphia. The ideas of each seller are largely determined by his individual condition, and prices are therefore considerably mixed. Consumers are taking nothing that they can get along without, and business is thus hedged up in narrow limits. Stocks in buyers' hands are very low, while those in the hands of furnacemen are still uncomfortably large, though it is probable production and consumption are now about on a stand. One 2,00-ton order for Southern coke iron was closed here in the past week, but most of the business has been in small lots. Buyers whose requirements are large recognize that present prices are low and a few are taking advantage of some of the exceptional cut prices that are quoted here and there. Leading Pennsylvania brands are held at $12.25 to $12.75 for No. 1, and $11.75 to $12 for No. 2x and $10.75 to $11 for standard gray forge. Southern irons have sold at 50 cents less, and at Baltimore and intermediate points to Harrisburg the above quotations have been lowered by 75 cents to $1. Billets are held at $21.50, seaboard, but there is no demand, as outside finishing mills can not pay that figure. Of the steel that can be had outside the pool at lower figures, only certain sizes are available and an average specification could not be filled up. Some of the near-by mills that were operated fairly full in July, have been idle most of the time since Aug. 1. Some resumed on Monday after a week's shut-down, orders having accumulated meantime. A few of the larger concerns have been kept quite steadily occupied. Bar iron is quoted 1.10c to 1.20c at mill; tank plates, 1.40c to 1.45c; angles, 1.30c to 1.40c; beams and channels, 1.70c to 1.80c. Old material is very dull. Quotations for No. 1 wrought are $12 to $12.50; machinery cast, $10 to $10.50; old iron rails, $13.50 to $14; old steel rails, $12.50 to $13; wrought turnings, $8 to $8.50; cast borings, $6.50 to $7; old car wheels, $12.

SIR HENRY BESSEMER and Sir William Siemens have been reproached with inventing and introducing processes that have practically ruined the manufactured iron industry of the United Kingdom, says an English exchange. To a large extent this has no doubt been the case. The production of wrought iron during the last fifteen years has dropped from 2¾ to 1½ million tons, while the production of steel has more than doubled. But even this movement, revolutionary and disastrous as it has been, has not been unattended with its compensations. The basic process of steel making is now largely carried on by the aid of puddler's tap, which would otherwise have been a waste product, but which is now eagerly bought up by basic steel manufacturers at 5s. to 6s. per ton. It is usual to employ from 50 to 70 per cent of puddler's tap per ton of basic iron produced in the blast furnace. This substance usually contains from 45 to 55 per cent of iron, and from three to six per cent of phosphorus, and it is the latter metalloid otherwise not only useless but deleterious, that chiefly makes the product valuable. It is the presence of the large reserves of puddler's tap in Staffordshire, etc., that has enabled the pig iron trade in these districts to keep alive.

THE plant of the Ohio Steel Co., at Youngstown, O., will not be in operation this week and no date is appointed for resumption.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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AUGUST 13, 1896.

AN ARGUMENT FOR SOUND MONEY.

The antidote to the free silver poison that has been injected into much of the popular thinking on the money question is being freely and effectively applied. The work of education cannot be completed in a day; and it will be slower in some cases than in others, because ill success, whether through incapacity or misfortune, has made some men ready for any change. The thought with many, who are deeply in debt or who have not succeeded in their undertakings, seems to be that they are badly off now and personally can't be hurt by free silver, whatever comes to the rest of the country; while above all other considerations, is the seductive suggestion of the free silver advocate that it will be easier to pay their indebtedness under unlimited coinage at 16 to 1. Still deeper, and not openly avowed, is a reason that is influencing some peolpe, as it did in 1892—envy and jealousy of those who through thrift and industry and ability have accumulated something. This spirit opens minds to the most sophistical arguments and readily breaks down the guards that would ordinarily be up against false reasoning or false morals.

The cure for the free silver disease where men are open to argument, is the clear statement of the truth about the monetary policy of the United States from the beginning, and the apprehension of these facts by the reader, together with a proper appreciation of the immediate and remote effects upon capital and labor in the United States, of the adoption of free coinage. Some of the literature that has been prepared to set right those who have leaned toward cheap money, has dealt with one set of facts; other publications have given part of the truth from another standpoint. Statistics have been used with telling effect in disposing of the glittering generalities that have attracted not a few. In the following letter the statistical method is not followed; but instead the writer presents deductions from figures and history. The statements cannot be controverted and the argument, while having nothing to do with the "crime of 1873" or the history of coinage ratios, is comprehensive and clear. The writer of the letter, Mr. Geo. D. Boulton, has long been at the head of the foreign exchange departent of the First National Bank of Chicago, and is a high authority on questions of finance:

CHICAGO, July 10, 1896.

Charles Morgan, Barrie, North Dakota.

MY DEAR MORGAN—Your brother showed me a letter a few days ago in which you asked for some reading matter on the gold question. As I feel strongly on the subject, I may as well give you the benefit of my crude ideas, not having any printed matter at hand.

There are a good many leading points on this queston which I think can be briefly expressed and which appeal strongly to my side of the argument.

One of the most urgent motives of the silver party is that they want cheap money. By that I suppose they mean money they can borrow cheaply or earn cheaply. Now, the cheapest money in the world is in the strongest gold country—viz., England. The dearest money in the world is in the silver countries. For example, money in London to-day is two per cent per annum, while money in Mexico, China, Spain, India, and in fact in all silver countries of the world, commands a loaning value of from 12 per cent upward. In the other gold countries of Europe, while money is not so low as in England, the rate varies from three to five per cent to the borrower.

I may cite as a good example of the two currencies two States adjoining one another in South America—one British Guiana, a gold country, with money at four to six per cent per annum; the other Venezuela, with like soil and climatic conditions, a silver country, where interest rules at 10 to 12 per cent per annum.

Circulation Would Be Decreased.

Should we depart from a gold basis Europe would undoubtedly send in all the currency securities—that is, securities that may be paid in anything but gold—to us, requiring an export of either gold or its equivalent in trade. If it takes gold it takes that much of our money circulation. If it takes merchandise it takes that at a largely reduced value. The consequence would be that shrinkage in money circulation would run into very large figures, while we could not put out silver or certificates sufficient to take their place for many months or years, so that during the next three or four years instead of the circulation increasing, as silverites hope, it would materially decrease. After the lapse of time, no doubt, by putting their printing presses and mints to work, they could largely inflate our currency with new issues.

Currency depletion means low prices for labor and everything else. Currency at a fair rate per capita means prosperity. Currency inflation means danger again.

Going back into history we find Europe using largely silver and gold together. With the expansion of trade one country after another found by sad experience their inability to keep the two values on a parity. England was the first to depart from this custom, then Germany, then France, Holland, Belgium, Italy, Austria, and, last of all, Chile. It was from no prejudice on their part, but from the requirements of trade that this course was taken.

We can only have one standard, be it of gold, silver or anything else, and the experience of the world has been that gold is the best. Again, where the country is most sound on its currency question, you will find the highest civilization. Where money is debased, or is other than the recognized standard of the world, civilization is on a much lower plane. We can find at the present time no silver country in the world, I think I might say wthout exception, that is in a prosperous condition, whose government securities command respect and full prices in the markets of the world.

To this statement our friends from the West will probably take exception, and cite as an example of a silver country being prosperous and in good condition the case of Mexico; but they will find it difficult to support their assertions. The writer had occasion last month to buy in the City of Mexico $50,000 of bonds issued by the Mexican government. These bonds were bought at the rate of 48 cents on the dollar in silver, the net cost to the purchaser being $24,170 in Mexican silver. As the money to pay for these bonds came from this country, the amount of America funds used in the purchase of $50,000 Mexican government securities was $13,012.11, or about 26 cents on the dollar. Now it seems impossible for

any country to be in a sound and prosperous condition whose securities are so heavily discounted as in the above case.

From the Intellectual View.

Looking at the matter from an intellectual standpoint, we find arrayed on the gold side the high intelligence of England, France, Germany, Italy, Holland, Belgium, Norway, Sweden and Canada. On the other side we find an inferior grade of intelligence an absence of public schools, and a lower plane of morality, as in Spain, Portugal, South American States, Mexico, China, etc. On which side shall we array ourselves?

Of course you understand it is not the intention of the party in power, or the gold party, to disturb the present silver circulation of the country, which is now $500,000,000. There is no desire to demonetize that. On the other hand, the whole contention is that all of our circulation shall be kept on a parity with the gold standard, and that this $500,000,000, instead of being reduced in value, will remain equal to gold anywhere. Borrowers throughout the country will have to recognize the fact that undoubtedly they will have to pay more for loans with silver ruling than they now do with gold.

Again, if gold remains the standard, and we give our endorsement of the principle that we believe it the only standard for us, the money markets of the world will be open to us, and instead of having to pay a high rate for money borrowed, the chances we will have to pay a very much reduced rate—less than that which even now prevails.

It is estimated that London alone has many hundred millions of idle money in its banks waiting for this matter to be settled, which will undoubtedly be released and used to a large extent on this side, if we commit ourselves unequivocally to the recognized standard of European nations. The course of events will be, if we make the change in accordance with the platform of the silver people, that in November, as soon as the silver president is elected, there can be no doubt at all but Europe will return our securities in large amounts. For these we have to pay gold or its equivalent.

Gold Will Advance.

This will entail a large export of the gold we now hold or of commodities. Gold will at once advance to a substantial premium. No legislation can probably be made by congress until well along in the summer of 1897, during which period our circulation will be very largely depleted by export and hoarding. The return of our securities has got to be at very much below the present valuation ruling on out stock exchange—probably 15 per cent to 25 or 50 per cent.

If we can avoid a serious panic during such a crisis we may regard ourselves as fortunate. Under the most favorable circumstances we must look for great disturbances in value to all classes, a disorganization of labor and a hardening of money and general financial trouble, which will be felt by all classes, whether the farmer, the laborer, the mechanic or capitalist. Capital can always take care of itself and will feel the trouble the least, as it can largely unload its burden onto others.

Now, legislation in favor of silver, when it comes, must be at least from nine months to a year off, and at the best it cannot do anything which will speedily restore our circulation to its normal amount per capita, as it takes time to coin silver, the capacity of our mints at present being only about $5,000,000 a month or $60,000,000 a year.

The following can almost be taken as axioms:

No silver country is prosperous.

No silver country has a stable and firm government.

In no silver country is general labor well paid.

No silver country has its government securities at par.

No silver country has good public school facilities.

This letter has rather rambled on into a lengthy epistle, but it may interest you, and I hope it will help you to convert one or two of your friends to the right way of thinking.

Sincerely yours, George D. Boulton.

Personal.

Mr. Horace V. Winchell, geologist and mining expert, of the firm of Sharpless & Winchell, Minneapolis, has gone to Washington to examine some gold mining properties. He will be absent about three weeks.

N. Baxter, Jr., president of the Tennessee Coal, Iron & Railroad Co., was in Chicago last week for a few days.

TIN PLATE TROUBLES.

The Tin Plate Manufacturers' Association was called to meet in Pittsburg, Aug. 12, but a quorum was not present. One of the objects of the call was to discuss the advisability of an advance in prices in view of the advance on foreign tin plates delivered at New York. The original "gentlemen's agreement" among the tin plate manufacturers extended only to July 1, but since that time it has been maintained because market conditions enabled the home manufacturer to get the schedule price, and in some cases a little more. The advance on foreign plates is about 15 cents a box for bright tin and seven and a half cents for ternes. All the tin plate mills that have been under union auspices heretofore have signed the scale except the America Tin Plate Co., of Elwood, Ind., which has proposed a reduction of 15 per cent for rollers, catchers and doublers and five per cent for heaters, while the turn limit of production has been raised about 800 pounds. As this company has a large capacity and has determined to operate non-union its action has an important bearing on the future of the market.

The failure of manufactuers to attend the meeting called for Wednesday indicates that concerted action is less likely in the future, as had been foreshadowed by the association's reference of the scale to individual firms, for separate action. The utmost effort has been put forth by the manufacturers the past year, to displace the foreign product, and this has been in a measure successful, imports being reduced nearly 25 per cent in the year ending June 30, 1896, from the total for the preceding fiscal year. But there has been keen competition at home—price cutting by concerns not well informed as to the cost of their product, or counting that a profit was being earned because no expenditure had to be made for the renewals which must come sooner or later. It was this hurtful policy that gave the Amalgamated Association the basis for its argument that as long as home manufacturers cut among themselves below the price of the foreign plates laid down at New York, they had no occasion to ask labor to stand a reduction on the ground that the present tariff is too low. The handicap of high-priced steel is now to be faced, and the probability that the number of non-union mills will be increased makes the immediate future uncertain and perplexing. The road of tin plate manufacturers has been a very rough one in the past two years and their troubles will be prolonged until a higher tariff permits the further wiping out of the import score.

Cheaper English Structural Shapes.

At last it seems as if British manufacturers were about to wipe out the reproach that has attached to the remarkable growth of the consumption of Belgian beams, girders, and pillars in this country. Of these various products of Belgian origin we are now consuming from 70,000 to 80,000 tons a year, and this trade has been allowed to grow up year by year until it may now be difficult to dislodge it. But it will probably be slowly wiped out, as it certainly ought to be. There are now four or five large firms engaged in the manufacture of beams and girders, notably the Glengarnock Iron & Steel Co., the Leeds Steel Works, the Frodingham Iron Co., the Shelton Bar Iron Co. and Dorman, Long & Co. All of these firms have made special provision for the girder trade, and it is no secret that some of them, at least, can produce girders as low as £3 10s. to £3 15s. per ton, which is, we believe, a lower figure than they can be produced for anywhere in Belgium. English manufacturers have the command of cheaper pig than their Belgian rivals. In some cases the pig is charged to the steel works in this country at no more than 33s. per ton.—[Engineering Review.

After thorough tests covering four months, the Grasselli Chemical Co., of Cleveland, has adopted the Playford mechanical stoker and smokeless furnace, a cut of which appears elsewhere. The chemical company will equip 40 boilers with these stokers at its works in Cleveland, Chicago, New York and elsewhere.

A recent advance sheet of the Carnegie Steel Co.'s "pocket companion" giving data about structural steel, adds an 18-inch beam to the list of standard beams, this having been agreed upon by the Association of American Steel Manufacturers. It will be rolled of four weights—70, 65, 60 and 55 lbs. per foot.

DESIGN AND MANUFACTURE OF GEARS.

At the last meeting of the Engineers' Society of Western Pennsylvania, in Pittsburg, a paper was read by Mr. Samuel Groves under the title "Notes on the Designing and Manufacture of Gears." Mr. Groves is a member of the well known Allegheny firm of Taylor, Wilson & Co., Ltd., and is its mechanical engineer. He has done much to perfect the manufacture of molded gears and has devised a gear molding machine which without doubt embodies the most advanced practice in this specialty. Mr. Groves was first in the country to advocate publicly the adoption of the one-tooth-in-gear system for high powers. We give liberal extracts below from the paper referred to, which was illustrated with drawings and photographs:

"It canot be denied that there is considerable difference of opinion among engineers as to the comparative mechanical advantages of the involute and epicycloid for contouring the teeth of gears. Because Brown & Sharpe have adopted the involute for their standard gear cutters—since this shape is easier to make and less costly to produce than the dual profiles of epicycloidal teeth—many have unreasonably jumped to the conclusion that the involute is necessarily the better form of tooth. The exact experiments, however, of Hawkins, Reuleaux, Cromwell and others, have demonstrated the very contrary, and have credited the epicycloidal tooth with the following advantages: (1) That the minimum number of cycloidal teeth which may be geared satisfactorily in a pair of like diameter, is 7, whilst the smallest number of workable involute teeth under similar conditions is 11. (2) That in cycloidal teeth less power is lost in overcoming friction than in involute teeth. (3) That cycloidal teeth, when considerably worn, retain their original shape much better than involute teeth under similar conditions. Indeed, the only advantage possessed by involute toothed gears is, that the shafts upon which they are hung, may be slightly varied without disturbing their harmonious working, whereas, any alteration in the centers of cycloidal toothed gears is detrimental to their accurate rotation and full efficiency. It is porbably this latter fact, which has induced many an engineer in charge of rolling mills, to look with favor upon the involute form of tooth; for the operating mechanism of a train of rolls, or a bloom shear, is constantly subjected to such terrific shocks and abnormal strains that it is next to impossible to keep the journals free from excessive wear, and the shafts from getting out of line. Had not steel gears come upon the scene, we should doubtless have heard more about the relative merits of the involute and the cycloid. The discussion was silenced by the advent of costly steel castings, excessively proportioned. Keen competition, however, and enforced economy, is opening out the question again. But the tendency of late has not been to take up the question of tooth curvature; but to entertain an altogether heterdox idea, involving not only a new departure, but a radical change in our conception of the conventional mechanics of gearing. Until very recently, the aim of every designer of toothed wheels was to get two or more teeth in gear at a time. To accomplish this, it was necessary that the teeth should be long and seven-tenths of the pitch became the standard length. In calculating the horse-power of a gear, the tooth was always recognized as a cantilever, liable to be broken off at its root by a lever strain. The new departure consisted in so proportioning the tooth, that the old lever strain was transformed into a shear strain; instead of breaking off, it had to be pushed off. This desired economy was attained by reducing the length of the standard tooth from .7 to say .5 of the pitch, and shaping the flanks in such a manner that although there was only one tooth in gear at a time, yet wherever gears with this short tooth were practically applied, they rolled so noiselessly and with such manifest power of resistance, that the spectator could only stand and wonder why long teeth should ever be used for the transmission of high powers.

"In the spring of 1895, the 13-inch 'Belgium' mill of the National Rolling Mills, McKeesport, Pa., was disabled owing to the breaking of a large steel gear eight feet four inches in diameter—with its complementary pinion having triple staggered teeth. As many as six teeth in a row were torn out at the roots. Gears with double helical teeth had failed previously. I was requested by the engineer to investigate the case, and without hesitation undertook to design a cast iron gear and a pinion with straight, spur teeth, *having only one tooth in gear at a time*, . The offer was accepted. The gear was eight feet four inches diameter, seven-inch pitch, 22-inch face, weighing 12½ tons, and the pinion 4¼ tons. This pair have been running uninterruptedly for over a year, demonstrating that with properly designed short teeth, instead of long teeth, gears made of cast iron may succeed, where steel proved a miserable failure.

"Indeed, one could occupy the whole of the time at our disposal in the citation of trustworthy facts showing the unwisdom of using teeth .7 of the pitch on large spur driving wheels and pinions, transmitting great powers and running at high velocities: for the evidence is overwhelming as to their unfitness to resist wear and tear. On the other hand, one could advance case upon case, instance upon instance, proving the remarkable adaptability of short teeth .5 of the pitch—or less, working under like conditions—to successfully resist the wear and tear of actual work. My object, however, is not to do a piece of special pleading in defense of a 'fad,' but to still further popularize the idea, the practical adoption of which I believe would be on the lines of progress and economy. And I may be permitted to remark in concluding this part of the discussion that when the one-tooth-in-gear system comes into general use for high powers,—as it assuredly will—then high-priced, irregular gears of the double helical and staggered tooth type (which are almost impossible to mold with the necessary degree of accuracy, which are exceedingly difficult to set on their shafts, and which are after all of questionable advantage) will be relegated to the limbo of curiosities; for spur wheels with short teeth embody all the advantages claimed for these irregular gears as regards strength, and at the same time are manifestly superior as regards mechanical adaptability and practical application.

"Having dealt with the question of teeth, we now pass on to the allied subject of the spokes or arms. The most artistic form of arm is undoubtedly the oval, but its use is limited to comparatively narrow faced gears, for its minor axis is parallel to the face of the teeth, thus leaving a portion of the run on either side of the arm unsupported, consequently, it is usual to introduce sectional arms into gears with wide faces, since, by this form, the entire face is supported without excess of metal, whilst the strain upon the teeth is equally distributed throughout the entire plane of the gear.

"In the general designing of a gear wheel there is a factor of supreme importance, which one has ever to keep in mind, and that is the necessity of attaining uniformity of section, with a view of realizing uniformity of shrinkage. I well remember, among other instances of the deplorable consequences of neglecting this law of uniform sectioning, one remarkable case. A gear wheel had been cast one evening, and the next morning was brought out of the foundry to the cleaning ground. About noon, a noise was heard like the report of a cannon. Upon examining the wheel, it was discovered, that one of the slender cross arms had separated from the rim, and there was a space of nearly three-eights of an inch; indicating that the rim had been in terrific tenson. The cause of the bursting was this: the gear—for which this was a substitute—had been broken through the rim, owing to some severe shock or blow; consequently it was ordered to make the rim about three times the thickness of the tooth on pitch line. This was done, and it made the sectional area of the rim about three times that of the arm where it connects to the rim; hence, when the gear was cast, the metal in the arm cooled much quicker than that in the rim, so that finally the comparaitvely delicate section of the arm could not resist the enormous shrinking pull of the hub and root of the arm on the one hand, and the heavy mass in the rim on the other, and consequently, burst asunder. True, the fatal effects of this inequality of sectioning and shrinkage might have been obviated by removing the sand from the hub and rim of the newly poured casting, thus accelerating the cooling of these massive parts, and balancing the cooling rate of the lesser arm sections. But there is no need for resorting to these tricks of the foundry if the law of equal sectioning is observed. In subsequent practice, the object lesson cited was a constant reminder of the necessity of making the arms and rim of a gear as nearly of equal sectional area as the circumstances of the case would permit. It is a sound practical rule in gear

design, to make the thickness of the rim equal to the thickness of the teeth on the pitch line, for gears without shrouds.

"Again, some engineers have strong notions about keys and keyseating. A small shaft may occasionally be seen with an abnormally large key, hence the metal between the outside of the gear hub, and the corner of the keyseat in same is very meagre. Many a gear wheel has been torn from its shaft, the tear having been caused by an oblique rent starting at the corner of the keyseat, in accordance with the law that the strongest part is the weakest point. It is an excellent device to reinforce all hubs over their keyways, by taking the corner as a center, and striking a radius equal to thickness of hub +⅛-inch for small, and thickness +¼-inch for large bores. By so doing the thickness of metal in the hub may be reduced to a minimum, thus still further contributing to an equalization of section, and consequently a sounder and stronger casting.

"We now leave the debatable ground of opinion in the designing of the teeth, arms, and hubs of gear, for the practical domain of manufacture: The first cast iron gear wheel was made about 1782, at the Coalbrooke Dale Iron Works, Staffordshire, Eng. Until about 25 years ago, the common practice in the foundry was to make the castings from full patterns, or in

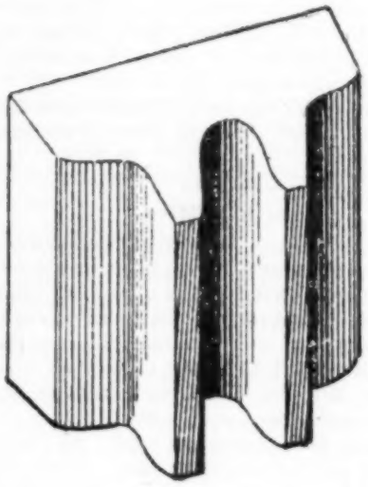


FIG. 1.

some instances by means of a section of the rim, while in others the teeth were formed in cores. About the year 1870, however, Jackson, of Manchester, Eng., began to make gears by machinery, doing away with full patterns altogether. From that time until now the machine-molded gear has been gradually superseding the old-fashioned hand-molded gear, made from full patterns.

"That machine molding is superior to hand molding in the manufacture of gear wheels needs, in these days of enlightenment, no elaborate proof. Pattern molded gears are necessarily defective, for the diameter at the opposite ends of the teeth must be unequal owing to the draft given to the pattern, while the rapping needed to draw the pattern oftimes causes the wheel to be out of round. Besides, whoever saw a full pattern drawn without patching? It is claimed that the defect due to draft is practically overcome by carefully meshing the gears with 'cope' and 'drag' together. A manifest fallacy, for if the teeth are tapered, their driving contact can only be at the extreme ends and not across the entire flanks, which accounts for the common experience of the breaking of the gear teeth at the corners. But even where the first castings from complete wooden patterns are fairly accurate, the rapping and soaking with water, essential to the withdrawal of the pattern from the sand causes it to warp, so that when the pattern is taken out of the store for subsequent castings, it is found to be so radically out of shape that another expensive pattern has to be made. Then again, look at the area needed to store these complete patterns, especially the larger sizes! Further, take the matter of pattern expense. A full pattern, say 40 inches diameter, 84 teeth, 1½ pitch, 4½ face, properly and strongly made, would take an expert pattern maker at least five days, and cost from $20 to $25. If, however, it was proposed to make a gear of the same dimensions on the machine the only pattern needed would be a block having the form of a single tooth space for making the teeth molds (Fig. 1) a sweep for forming the tooth backing, a box for making the green sand arm cores, and another plain box for making the dry sand center core. These preparations would be made in about two days, at less than one-half the cost of the complete pattern, and the work would be in the foundry, the gear cast, cleaned, and in the machine shop before the complete pattern was even into the foundry. Besides, with ordinary care, 100 castings could be made off these preparations without any appreciable diminution in the matter of accuracy and finish. I have here a photographic print (Fig. 2) of a pair of large gears 74-inch .50 pitch diameter, 78 teeth, three-inch pitch,

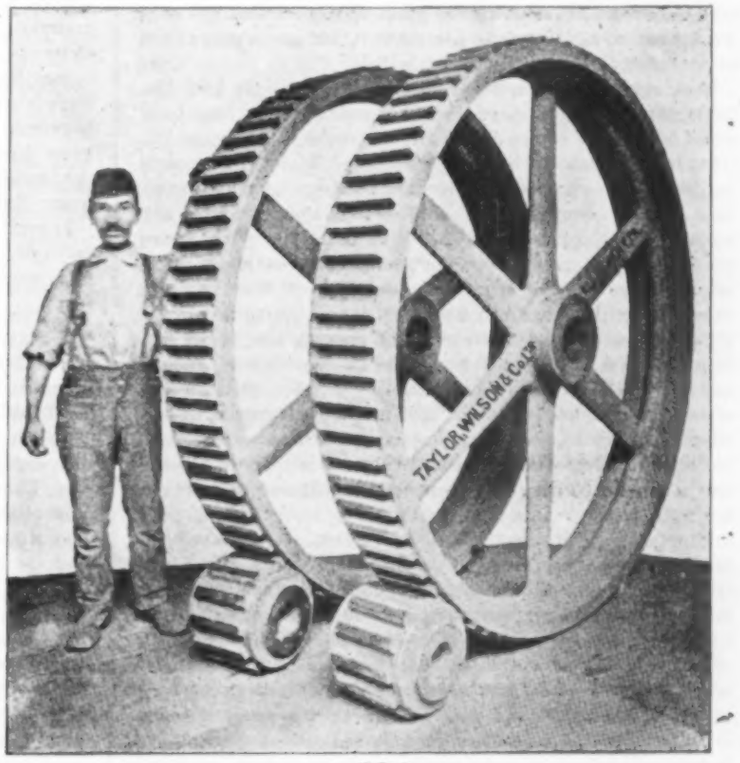


FIG. 2.

eight-inch face, double shrouded, weighing about 1¼ tons each—made upon one of our machines within the last few weeks. The feature about these wheels is, that neither hammer or chisel was used in the cleaning of the teeth, for upon hoisting the castings from the sand the burnt facings simply peeled out of the tooth spaces, leaving a bright, smooth skin, having the appearance of cut gears. Indeed, gears made with this degree of perfection are immeasurably superior even to cut gears, since, although the latter give smooth running, they do so at the expense of the life of the wheels, by the cutting away of the hard skin of rich combined carbon from the flanks of the teeth; leaving the opener grained graphite for a wearing surface. In fact, so superlative are the advantages of molding toothed wheels by machinery—namely, in the absence of costly patterns, abandonment of draft, and in the greater accuracy of pitch—that the passing of the antiquated hand molded pattern gear, is only a matter of time. For increased economy and mechanical efficiency are factors which the progressive engineer can not afford to disregard."

THE Pennsylvania Co.'s shops at Altoona, Pa., will be run but five 8-hour days each week until further notice.

A NOTEWORTHY WORK ON SOUTHERN IRONS.

IRON MAKING IN ALABAMA. By Wm. B. Phillips, Ph. D., consulting chemist Tennessee Coal, Iron & Railroad Co., Birmingham, Ala. Issued by the Alabama Geological Survey. Paper cover. 164 pages.

Remarkable as have been the developments in Alabama, in the past 20 years, in the making of pig iron and in the dependent industries of iron mining, coal mining, coke making and limestone quarrying, it has remained for the author of this volume to present a comprehensive review of the advance made by the furnace interest of the Birmingham district, both from the metallurgical and the commercial standpoint. Dr. Phillips, in his nine years' connection with iron making in Alabama, has been closely allied with the forward movement among Southern furnaces. He is abundantly able to make generalizations, because of the vast body of data he has gathered. Personally he has accumulated nearly 10,000 analyses of the various materials used in making iron in Alabama. These represent hundreds of thousands of tons of iron ore, limestone, dolomite, coal and coke, and cover a period of many years. While at various times in the past 20 years articles, more or less elaborate, have appeared, dealing with the elements of cost in making Alabama iron, the character of the ores, furnace burdens, fuel consumption and kindred questions, Dr. Phillips has given us a work that not only comprehends all that has preceded it, but gives many data never before available.

In a brief introduction the author starts with the first Alabama furnace, which produced charcoal iron and was built about 1818, and comes up to the first coke furnace, the Eureka, built at Oxmoor by Col. J. W. Sloss, in 1876. He points out that there is a vast difference between the situation today, with a yearly output of 1,500,000 tons of coke and 800,000 tons of pig iron, and that of 20 years ago, when it was not certain that good coke could be made from Alabama coal on a large scale, and when the use of Red Mountain ores was a vexed question. No more striking illustration of the great change that has come over the manufacture of pig iron in Alabama during the last few years can be adduced than to say that the total cost of production is now less than the cost of raw material five years ago." This has been rendered possible, not only by reductions in the cost of the raw materials, but also and particularly by improvements in furnace practice and a closer alliance between the chemist and the superintendent."

Ninety pages of the body of the volume, which take up in order the ores, the fuels and the fluxes of Alabama furnaces, contain the matter that will give the work a permanent place in the literature of iron-making. Naturally much of this space is given to the discussion of ores. While not a little effort has been made toward the improvement of Alabama ores preparatory to their use in the blast furnace, much remains of the wholesale methods of earlier years. It seems strange to the furnaceman who buys Lake Superior ores strictly on analysis, every unit of iron receiving its price and the presence or absence of other elements being closely gauged also in the price, that it should still be the rule in Alabama to pay so much per ton, whether the ore carries 40 or 47 or 50 per cent of iron. Yet when ore is sold for stock-house delivery at a fraction above a cent a unit, as against a unit cost of about six cents at Mahoning valley furnace, for a non-Bessemer ore, from the Buffalo mines (Lake Superior), for example, it can be seen that the Southern furnaceman is scarcely in position to be too rigid in his insistence on uniformity and a unit cost basis. The attempts at improving the quality of Alabama ores have been confined thus far almost entirely to the brown ores and the methods are described by the author.

Considerable space is given to a discussion of the limey or hard ores, the best of which carry more lime than is required to flux their silica. It is found in general that the amount of ore used per ton of iron made increases with the increase in the percentage of hard ore. The coke consumption also increases; but the consumption of limestone decreases materially with the increase of the hard ore percentage. The soft ores, which were so extensively used in the early days of the region, and the limonite or brown ores, are described in detail. Of late years the tendency is decidedly toward a larger proportion of the hard ore, rising in some cases to above 90 per cent of the burden. Tables are given covering thousands of charges with varying percentages of the three kinds of ores, and deductions are drawn as to the cost of iron, proportion of foundry iron made, etc. In general when the proportion of hard ore rises above 66 per cent, irregularity in furnace operation increases. One table embodies the results of 40,270 charges and 66,653 tons of iron, with the following as the delivered prices of materials, per ton of 2,240 pounds: Hard ore, 67.5 cents; soft ore, 55.4 cents; brown ore, $1; coke, $1.75. The lowest cost of materials per ton of iron was $3.97, these charges containing 48.5 per cent of hard ore in the ore burden, 50 per cent of soft ore and 1.5 per cent of brown, with coke consumption of 1.24 tons per ton of iron.

The range of coke consumption in producing Alabama coke iron is put at 1.16 to 1.72 tons of 2,240 lbs., the observations covering 150,000 tons of iron, made from 1890 to 1895. The average consumption of coke per ton of iron is set down as 1.41 tons of 2,240 lbs. "The average for the best coke made in the State may be taken at 1.30 tons of 2,240 lbs. for a ton of iron of 2,240 lbs. A pound of iron has been made in the State with less than a pound of coke, but for a very limited period."

Further comment upon Dr. Phillips' admirable book and extracts from it must be reserved for another time. It is replete with valuable information on the one line which it attempts to follow out with special elaboration, namely, raw material costs of Alabama furnace burdens. The remaining elements of labor, renewals, interest, insurance and all that comes under the head of administration, are of course not under review. But enough is given to convince Northern furnacemen that the pressure from southward is not destined to grow less, and that Alabama pig iron at $6 at furnace does not contain so many possibilities of speedy bankruptcy as many Northern producers have been wont to think.

It must be said that a work involving so much painstaking labor on the part of the author deserved better at the hands of printer and proof reader.

Lake Superior Iron Mines,

The fourth annual meeting of the Lake Superior Mining Institute will be held at Ishpeming, Mich., beginning at noon on Tuesday, Aug. 18, and ending Thursday, Aug. 20. Early Tuesday afternoon the members will start on a tour of the Ishpeming mines, taking in order the Lake Superior Hard Ore, Lake Superior Lake Shaft, Cleveland Lake Shaft, Cleveland East End, Lake Angeline Lake Shaft, Lake Angeline Old Mine and Salisbury. After a visit to the Excelsior charcoal furnace the party will return to the hotel. An evening meeting for business and papers will be held. On Wednesday an early start will be made for Champion and Republic Negaunee being taken in on the return. Teal Lake and Buffalo properties will be visited after lunch. At the Buffalo mines a train will be taken to Marquette, or rather to the new docks at Presque Isle, two miles from Marquette, the trip being made over the new Lake Superior & Ishpeming ore road, now hurrying to completion. Returning to Marquette by steamer or electric line, the second and final meeting for papers and discussions will be held after dinner. In the morning a special train will be taken to Ishpeming and there a party will be made up to visit the new Pioneer Furnace at Gladstone. The meeting will close Thursday afternoon. A description of the important mines of Marquette county has been prepared for the meeting by Geo. A. Newett, State Commissioner of Mineral Statistics. The papers to be read include the subjects of electrical underground haulage, pumps and methods of sampling. Other subjects may also be presented.

The Chapin Mining Co. has completed the pumping out of the water in the Hamilton and Ludington mines, and has started crosscuts to connect them with the workings of the Chapin. In this work they have encountered a new lense of ore the dimensions of which they know but little of as yet. In point of quality the new ore is very high grade. The ore at the Chapin occupies parallel lenses, and there is no telling excepting by exploration, as to how many of these may occur. There is every reason to expect more than has already been revealed on either side of the main lenses. There may be something done in the way of diamond drilling at some time in the future, but at present the company as more ore than it can dispose of.—[Iron Ore.

ECONOMIES IN METAL-CUTTING TOOLS.

In the fifth instalment of his excellent articles on "Machine Shop Economics," in the *Engineering Magazine* Horace L. Arnold takes up the economies in the use of the newer types of the metal-cutting machines. His introductory observations are reprinted below:

The machine-shop superintendent desires to produce the most work for the least cost. The work consists wholly in changing metal forms, by founding, by forging, and by cutting; these changes in metal forms are produced partly by natural, unintelligent agencies, and partly by the efforts of the workmen. Fire and water; the stream of melted metal flowing into the mold; the hammer and anvil; the hammer and chisel; the muscles of the molder, the blacksmith and the whitesmith,—these were the agencies by which Tubal Cain and the builders of Solomon's Temple wrought their marvels, and they are the agencies which the machine constructor must employ to-day. There has been no broad change in the means of working metals and changing metal forms from the very first until now, excepting electro-plating, and that marvel does not greatly affect machine construction, because of its comparatively great cost and the uncertainty of its results in large masses.

The hammer and chisel, the file and the lathe, and the workman are still the agencies with which the machine-shop superintendent must do his work, and the single problem of the superintendent's shop-life is to find the most effective use of these simple agencies, to learn how to make the greatest change in metal forms with the least cost, and so build the most machinery for the least money.

Labor is the costly factor in machine production; the shop and tools, once furnished, stay there; they last long and cost little for maintenance or renewal; labor is a constant and great expense; the most work for the least labor is immediately seen to be the real problem and its only solution lies in making machines build machines, instead of using men for that purpose. In case of a simple form of small machine, like a pin or a cartridge-shell or a screw, manual labor can be almost wholly replaced by machine work. A screw-making machine may work for an entire day, or sometimes for several days together, without being touched by the hand of man. Even in the case of pieces weighing hundreds of pounds, suitably-contrived machines can reduce the labor cost of finishing to inconsiderable sums, so that the very same operation might have a labor cost in one good machine shop of, say, a dollar, while in another shop the labor cost would be only ten cents, the difference in the two shops being that the one is fitted for general work only, while the other is supplied with special agents for producing this particular form of piece. The superintendent is, therefore, confronted at the outset by the problem of tools specially suited to his work. He sees a tool, fitted for a certian operation, reduce the cost of that operation to a small fraction of its cost by ordinary methods of finishing, and draws the general, and true, conclusion that equally suitable tools for his entire range of operations might vastly reduce the total cost of his work. Following this conclusion, he also sees that no shop can be large enough, and no shop owners can be rich enough to equip a shop in the best manner for making all kinds of machines, and this leads at once to the special shop, fitted with specialized tools for the production of one particular machine. He sees also that the general shop can draw revenue from many near-by sources; his own shop may have an established and valuable trade in many different lines; if all but one of these lines of production are abandoned, then he must go far afield to market his wares, which means a vast selling expense connected with his cheap product, and the concern's eggs all in one basket; rivals may enter the field, close competition may follow his successful efforts, and ruin supplement his most triumphant success in production of the single thing.

The old shops began with the hand lathe about a hundred years ago, as the sole machine tool. All that could not be done on the hand lathe was done in the smith shop, or with the hammer and chisel and file. Everything else has come into the machine shop within the last hundred years, and almost all of it within the memory of men still in service; and all that we now call modern or regard as effective is of very late construction indeed. Fifty years ago the iron planer was a special tool, and there was not an efficient engine lathe in the world perhaps,—certainly not in America; drilling machines, milling machines, and chucking machines were generally not known at all, and where some raw, inefficient form of either of these machines was known, it was regarded as a doubtful experiment, and the milling machine, in which the multiple-cutter idea is carried to the ultimate, is still an uncertain factor in machine production.

The well-informed, broadly-seeing superintendent passes this review of the old days before his eyes, and sees that the end has not been reached; that he may yet vastly reduce the labor cost of his product by improving his metal-cutting machines; and that more roads to prosperity will open to him if his improved tools are general in their field of usefulness than if they are narrowly limited in lines of efficiency. He can draw but two conclusions: he must either select one specialty, and sink or swim as he fails or succeeds in his effort to lead his rivals; or he must use the best general tools which he can buy or make, and must reduce the labor cost attending these superlatively excellent general tools to the lowest possible figure, and so be prepared to meet general demands for machinery with the most efficient and economical means for general machine production. If he has an old and inefficient plant, he must throw it away, either piece-meal, or in a lump. If he has workmen whose motto is "a fair day's work for a fair day's pay," he must either have a new force, or he must change the views of his old hands. And he must work his changes slowly, gradually, imperceptibly almost, or he will lose the confidence of his employers and antagonize his men, and end in the disreputable loss of his position. It is the superintendent who must order the shop equipment, and must direct changes and be responsible for economic production; hence the superintendent is here treated as the principal. The owner and manager desires cheap production, but he does not desire to make a large outlay to secure this low cost of work; his tools were the best at the time of purchase, and the manager is loth to believe that these one-time masterpieces are not still the best of their kind, or so nearly equal to the best as to make any wholesale replacing of his plant not only needless, but absurd. Yet the competent and well-informed superintendent knows perfectly well that he could double, treble, or quadruple the result of an hour's work by the use of tools that are not experiments, but thoroughly tried successes. Some of his tools are too light to take the heavy cuts which work would stand; other machines which might well have several tools in simultaneous cut are fitted with only a single tool post; a hand is attending but a single machine, or perhaps two machines, where he might as easily, or even more easily, attend four, six, or eight machines, each doing as much as or more than the single machine which now occupies the entire time of the almost idle workman. It is only in the last 10 or 15 years that the haughty machinist has condescended to overlook two machine tools at work, but now the cry of "spoiling the trade," and even the theory that the smaller the day's work performed the more days' work there are to be done, have been abandoned by the greater part of machine-shop workers, and there is no objection to increasing production by having one man attend all the machines possible.

WALTER CRAFTS, the president of the Commercial National Bank, of Columbus, O., who was found dead in bed at the Monongahela House, Pittsburg, on Aug. 3, from heart disease, was at one time president of the Baird Iron Co., of Gore, O. He was later treasurer and manager of the Crafts Iron Co., of the same place; general manager of the Standard Coal & Iron Co., of Columbus; and successively vice-president, president, and treasurer of the Columbus & Hocking Coal & Iron Co.

THE production of Connellsville coke in the week ending Aug. 1, says the *Courier*, was 86,528 tons, a falling off of about 15,000 tons from the average output for several weeks preceding. The shipments were nearly 400 cars less than in the preceding week, falling to 4,815, and 573 ovens were blown out. W. J. Rainey has since shut down a number of ovens. The *Courier* adds: "The operators will not be surprised if Frick should decide to reduce his price, though they do not expect it at present."

VALUE OF CIRCULATION IN A BOILER.

It is generally understood that the cause of circulation of water in a steam boiler—in water-tube as well as horizontal boilers—is caused by the difference in specific gravity of the water produced by the addition of heat which increases the temperature and, consequently, the volume per given weight. When circulation has been produced so as to affect nearly all the water in the boiler, the rate of circulation then increases with additions of heat.

An expenditure of a certain amount of energy in the form of heat, of more than what is required for increasing the temperature, is necessary for starting and maintaining the circulation of the water. A given number of heat units may be found sufficient to raise the temperature of water to 212 degrees, but it will be found that an increased number of heat units will be necessary to cause the water to circulate, and a still greater number of heat units will be required to bring the water into a state of ebullition.

This extra amount of energy in the form of heat is required to overcome the cohesion of the particles of water; or, in other words, to overcome the resistance to flow. In the case of natural water, such as that from a lake or clear river, 70 or more units of heat will be required to overcome this cohesion, starting and keeping the water in motion. Water which contains an unusual amount of mineral matter in solution will require about double the number of heat units to start the water in motion, causing circulation.

When considering the amount of heat necessary to produce circulation, and considering that the water in the boiler is saturated with mineral matter, some of the heat unaccounted for between the coal-pile and the steam pipe may be considered as having been expended in keeping the water in circulation. The flow of water upon itself, although it is considered practically frictionless, requires an expenditure of energy to produce it. A little thought on the subject will make the matter plain to anyone.

It is often considered that water, in contact with the heated tubes and shell, becomes heated and its specific gravity thus lessened, circulation takes place without an expenditure of energy, but such is not the case, for it requires an expenditure of energy of some kind, in some way, to move any substance, or keep it moving against the resistance of friction of other matter with which it comes in contact. This fact may be readily recognized from observing a small object, no matter how light, floating on the surface of water acted on by a strong wind; the water may be put in motion after a time, but the surface water does not readily slide along on the portions below the surface.

The resistance of water against flow, and the friction required to overcome in setting it in motion, may be shown in many ways, and the amount of power required in such cases can be approximately calculated with ease The circulation of water in a boiler requires an equivalent amount of power to produce it, and the less obstruction there is to the flow, in the way of tubes or other hindrance, the less heat will be unnecessarily expended in the making of steam.

The old style of cylinder or "saw-log" boiler, which contained no tubes or other obstruction to offer resistance and impede the circulation of water, was capable of giving a higher rate of evaporation per square foot of heating service than any of the later styles of boilers. Such boilers were not of a type that finds favor in modern steam engineering practice, but the results of tests show that each square foot of heating surface of such a boiler had fully as great a capacity for evaporation as those of more modern form. This was because of the better position of the heating surface and the less resistance to circulation.

Free circulation of water in a boiler is often more favorable to steam-making than heating surface, especially so if the heating surface is disposed in a way that will impede the circulation of the water. This has been proven in cases where vertical rows of tubes have been removed from a horizontal fire-tube boiler, thus reducing the heating surface but increasing the circulation so that the efficiency of the boiler was increased, as was also the economical production of steam. In one case 17 per cent of the heating surface was removed, but the capacity of the boiler was increased more than 30 per cent, and the economy 16 per cent, according to tests made before and after the change.

Numerous experiments have proven that free circulation is a valuable thing in a steam boiler, and it seems that all of the plans employed for increasing circulation have also increased the capacity of the boiler and the economy of steam making even though power applied outside of the boiler had been used for increasing the circulation inside. Maxim's method of accomplishing this is by the use of an injector nozzle or jet, on the inside of the feed-pipe, and a water pressure which exceeded boiler pressure by 150 pounds or more.

With this nozzle or jet properly placed, and acting inside of another and larger nozzle, the force of a feed-water would act on a large volume of the water in the boiler, setting it in motion and keeping up a steady circulation. Maxim claims an increased capacity of boiler of fully 34 per cent and a greater economy, enough to warrant the addition of the device, even though the cost was sufficient to cover a large fee for use of patent.

Something like a propeller wheel has been introduced into a boiler and operated by power applied to the end of the shaft, which extended outside, for increasing the circulation of the water and thereby promoting the steaming qualities of a boiler.

As these experiments have all shown economical results in steam making and increased evaporative capacity, we cannot help considering that free circulation of water in the boiler is a most valuable adjunct to steam making. If increased circulation proves beneficial, even though it is produced by steam taken from the boiler and used in such uneconomical apparatus as ordinary feed pumps and small steam engines, which are known to use a large amount of steam per horsepower developed, it would be reasonable to suppose that if the circulation could be produced without external aid a greater conomy and larger capacity could be obtained at least cost; in fact, such has been shown in cases where tubes have been removed for the purpose of obtaining a greater freedom of circulation.

Experiments made some time ago on water-tube boilers by Yarrow & Co., of London, brought out some new points regarding circulation, which were, at first, thought quite difficult to comprehend, as they seem to do violence to what we believed to be the action of water in a boiler under such conditions; that is, that circulation was increased by the action of heat on the tubes in which the downflow of water took place. For the purpose of experiment, two glass tubes, the upper ends of which were connected to a drum, the other ends being connected at the bottom, were arranged to be heated by Bunsen heaters. The tubes being of glass, and heat being applied by smokeless flame, the circulation of water could be easily seen, and the action of heat on the tubes would readily show the effect produced. When heat was applied to one tube an upward circulation was started, and an increase of circulation was produced by a greater amount of heat being applied, whether the addition was to the upward or downward tube.

It is generally supposed that increase of temperature of water will cause a circulation in an upward direction. This is the case when heat is applied at one point only, as was shown in the Yarrow experiments, but was also shown that the application of heat to the downward pipe increased the velocity of circulation, even though the source of heat applied to the upward pipe was removed. This action appears phenomenal, and is difficult to explain until it is considered that water flowing into the downward pipes becomes of greater density, and as soon as it passes the lowest point the density begins to decrease.

When the circulating water is at the lowest point in the connection between the tubes, it is at the greatest density, and contains a greater quantity of heat than when it began to descend; as the flow of water begins to ascend the density is reduced, and the amount of heat in the water is sufficient to transform a portion of it into steam, thus making the upward column lightest, after which the circulation will continue even though all of the heat be applied to the water in the tube acting as the downflow.

It has often been contended that the heat applied to the sides of a horizontal, tubular fire-tube boiler was an impediment to free circulation, but in the light of the Yarrow experi-

ments it appears that the application of heat at such a point aids rather than impedes circulation, and gives full value in the making of steam. So, also, in water tube boilers the downflow pipes are beneficial in comparison with the amount of heating surface they contain, or nearly so, as in the experiments above noted there was a slight difference in the acceleration in the velocity of the circulation, it being slightly less when heat was applied to the down tube.

It has always proven a bone of contention among engineers as to whether the downflow pipes of a water-tube boiler, when exposed to the heat of the furnace, were of any value as heating service, and whether they were not more of a detriment than they would prove to be if placed outside the boiler walls, or in such a position that they would not be acted upon by the heat. The Yarrow experiment would seem to prove conclusively that such tubes were beneficial when employed as heating surface, the only requirement being that the circulation should first be established in the upward tubes.

Further experiments appear to have shown that even though all of the tubes were exposed of the same temperature at the experiment, the upward and downward flow would be established just the same, although it might occur in the opposite direction from what was expected or intended, and at one time the circulation would be in a certain direction and in an opposite direction at another time, the direction of circulation not having any perceptible effect on the economy or capacity of the boiler.

Another fact which has been demonstrated in connection with the free circulation of water in a boiler, the same fact having been noticed in experiments on feed-water heaters and surface consumers, is that the more rapid the circulation of the water the more rapid the transference of heat and the easier and more economically the boiler made steam. This we can readily comprehend by comparison of things with which we are more familiar.

The velocity of circulation of water in a steam boiler is never very great, and will seldom amount to more than 30 or 40 feet per minute, even in vertical water-tube boilers, under ordinary conditions of operation. In the Yarrow experiments, when the evaporation was at the rate of 25 pounds of water per square foot of heating surface—a very economical rate—the velocity of circulation did not exceed 60 feet per minute.

There is no mistaking the benefit of rapid circulation of water in steam making, for rapid circulation means that the water is free to move, while sluggish circulation means that the movement of the water is impeded; that means that power from some source is required to keep the water in motion. Such power must be obtained from the heat of the fuel; consequently, a boiler having sluggish circulation will require more fuel for the evaporation of a given amount of water than will another boiler in which the circulation is more free and less heat required to maintain it.

The best methods of obtaining free circulation of water in a boiler are difficult of selection, but all methods yet put into practice, of which we have read any account, have shown an increase in both economy of fuel and capacity of boiler. It is for this reason that large tubes, and set further apart, have superseded the older practice of using small tubes and as many of them as possible. Considerable increase in economy of steam making may be found in providing for a more free circulation of water in steam boilers.—["C. A. D." in the Boiler Maker.

THE firm of William Baird & Co. are now rebuilding some of their blast furnaces at Eglinton Iron Works, Kilwinning, Scotland, and have recently completed an extensive plant for the recovery of ammonia and tar from the distillation of the blast furnace gases. All the blast furnaces of Scotland are now fitted with ammonia plant, except two works, and it is probable that these will be similarly equipped before long. The effect of this installation is to reduce the cost of the iron by at least 85 cents a ton. The recovery plants, on the other hand, have added a considerable amount to the investment made in Scotch iron works. The average cost of such a plant is about $300,000, and some of them have run up to $400,000. Messrs. Dempster & Co., of Manchester, have fitted up a number of the leading plants. The Gartsherrie firm, which led the way in this branch of enterprise, has its own special system.

THE MARKET FOR MINING MACHINERY.

This is the busy season in the precious metal mining districts of Northern latitude and high altitude, and, notwithstanding the continued dullness in the general business of the country and the damaging effects of a heated political campaign, it may be said that the mines are fairly active. It is also the time of greatest activity in the construction and the erection of mining and metallurgical plants, for in many of the camps which are snowbound in the winter months transportation of machinery, timber, etc., is difficult or impossible until late in the spring, so that the delays incidental to road building, site grading, saw milling and other preliminary operations carry the actual installation of plant along into the late summer, fall and early winter months. This year a very large number of small and medium hoisting and pumping equipments are being set up or are still to be contracted for, while several very important metallurgical plants, especially in the line of gold amalgamating, cyaniding and chlorination works, are to be added to handle the increased tonnage from the many new gold mines which have reached a more or less productive stage. In connection with the heavy machinery of the mines and mills there is the usual corresponding demand for the numerous accessories and supplies going to make up a complete outfit.

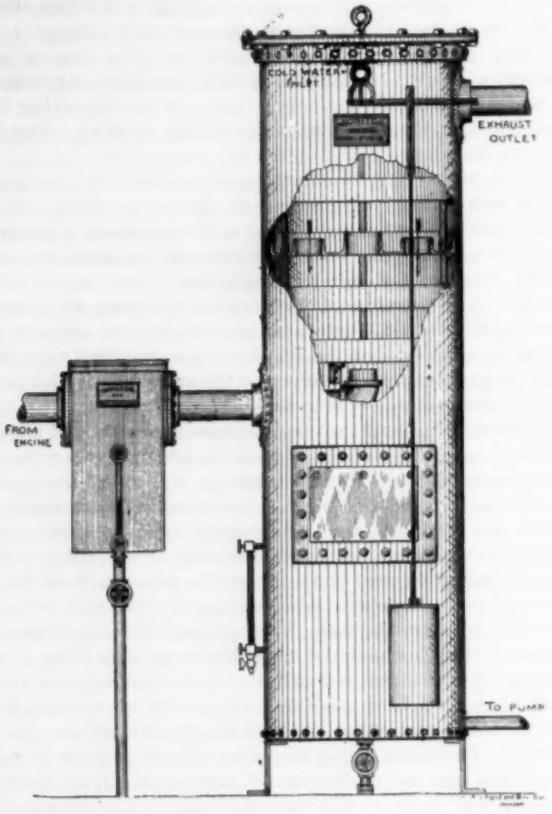
The foundries and machine shops have been and are quite active, with a large margin of time ahead for filling orders before next winter, and then they will be engaged in preparing to increase stocks of standard patterns to meet the expected calls for the usual spring trade. Taken as a whole, the position of the makers of and dealers in mining machinery and supplies, for the Western mines especially, is enviable as compared with that of the suppliers in many other branches of the manufacturing industry, and the more progressive men are taking advantage of it to push their trade.

In times of general business depression dealers and manufacturers seem to incline to one or the other of two opposite extremes of policy. We are referring now to all those who are engaged in the construction and handling of mechanical goods and supplies, and not merely to those interested especially or exclusively in the mining trade. Some of the ultra-conservative ones think it best to draw in their horns and cut down expenses as closely as possible, preferring to wait for a favorable turn in the general business situation. Some of them even curtail the only means of holding or extending their business, and call in their traveling men, close their branch agencies, and shut down their advertising, just at the very time when these instrumentalities are most needed. The result is that they drop behind and out of sight in the race, and on the revival of business are in no shape to compete with their more far-sighted rivals. The other policy is the one which wins in the long run. Those who keep their manufactures constantly before the attention of the prospective buyers, who seize upon every opportunity to avail themselves of whatever contracts are at the time open, and who look far enough into the future to plan out for extended operations at the earliest moment the conditions allow, will be in an advantageous position when more orders come in spontaneously, and meanwhile they get their full share, and more of it, of what business is going.

All this applies to the makers of machinery, etc., designed especially for the iron ore, iron and steel, coal and other industries which have not yet recovered from the set-back of three years ago, but which are bound to resume their normal status sooner or later. But it applies with far more force to the concerns dependent upon the flourishing gold-producing industry. In this particular field it is noticeable that very many foundries and shops which have hitherto missed their opportunity are endeavoring to seize upon the existing favorable conditions and work up a fair share of this trade. Gold mining has lately been more fortunate than almost any other occupation, and there is plenty of money ready to put into development and equipment of the mines, since it is being recognized that it is not a question of a mere spasmodic boom, with speculative flurries here and there, but that there is a substantial basis for a permanent and healthy growth. The advent of the new competitors will cause the older establishments to bestir themselves.—[Engineering and Mining Journal.

MONITOR WATER PURIFIER.

The value of a water purifier in preventing the formation of scale in the boiler and therefore in securing the same amount of steam with smaller fuel consumption, has been demonstrated repeatedly in practice. The efficiency of the various devices offered for this purpose and the outlay called for, as compared with the saving made possible, vary widely. A simple form of heater, shown in the cut, is manufactured by the Monitor Water Purifier Co., of Jackson, Mich. The illustration includes also the Monitor oil extractor and governor. The separation of mineral and animal matter from the water, by the introduction of exhaust steam, is the object sought. The water is boiled and then brought in close contact with metal in a light film. The oil extractor is placed in the exhaust pipe in some convenient place between the engine and the purifier, and a separation is made of any oils that may be



in the exhaust. The steam passes into the purifier to do its work of heating the water. The illustration shows the interior of the purifier and the location of purifying pans. These are of cast iron 3½ inches deep, with a number of three-inch tubes three inches high. There is thus a body of water in each pan. Rising to the top of the tubes, it flows in a light film through the tube to the pan below, then through a filter to the water chamber. The filtering chamber is supplied with a door which can be removed for cleaning. The water governor shown is operated by a float connected to the water chamber.

In the oil extractor is a series of plates, perforated and corrugated, and placed in the chamber in grooves. The perforations are of good size, and the plates may be taken out and cleaned by removing the cover.

Jennings Bros. & Co., of Pittsburg, went into receivers' hands Aug. 1. The Safe Deposit & Trust Co., of Pittsburg, and W. D. McKeefry, of Leetonia, O., were appointed receivers, both being heavy creditors. No statement of resources and liabilities can be made yet, nor is it known whether work will be continued by the receivers.

The Interstate Commerce Commission report says that the total railway mileage in the United States on June 30, 1895, was 180,657.47 miles.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants :—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

The Goodman Engine & Machine Co., Pittsburg, will apply for articles of incorporation. The promoters are Joseph Goodman, James Hogan, Henry R. Hissrich, Nichlaus Weber and H. E. Lineawater.

J. A. Wiggs, Jr., and others have incorporated the Robinson Foundry & Machine Co., of Birmingham, Ala., with a capital stock of $25,000.

A company has been formed in Philadelphia, for manufacturing heaters with a capital of $100,000. The officers are: J. Chas. Beckfield, president; R. Ahlberg, vice-president; Aug. Buerkle, treasurer; C. L. Dixon, secretary.

The Stevenson Wrench Co., Northeast, Md., is in the market for two plain milling machines (geared), one medium-sized shaper, one 15 to 18-inch lathe, small drill press, one heavy nut tapper, pulleys, shafting, hangers, 35 to 50 h. p. engine and boiler, etc.

At the office of the Supervising Architect, Washington, D. C., sealed proposals will be received until 2 P. M., Aug. 26, for removing the hydraulic machinery of the present compression tank system and furnishing and erecting one electric passenger elevator in the U. S. Court house and Postoffice building, at Erie, Pa.

The Krueger Rawhide Belting Co. has been incorporated at Chicago, with a capital stock of $50,000, to manufacture belting, etc., by Alfred Krueger, B. L. Anderson, Henry Eckhardt, and Geo. Williams.

J. A. Woodson,, receiver, Little Rock, Ark., is in the market for 110 tons of 35-lb. relaying rails, iron or steel, delivered at Smithton, Ark.

The Cullman Wheel Co., 554 Larrabee st., Chicago, wants to buy a milling machine suitable for milling bicycle sprockets.

The Fountain Machine Co., of Cincinnati, has been incorporated, capital $25,000, by Emil Hilstach, Anthony Goeshel, John S. Thompson, John E. Jones and Louis E. Fricke. The company is to manufacture and sell hot air engines, gas engines and gasoline engines, and do a general business in manufacturing , dealing in, and repairing engines.

The Virginia Iron Investment Co., Basic City, Va., has been chartered for the purpose of manufacturing iron, erecting buildings, etc., with capital stock placed at $50,000. J. W. White, is president; Spencer P. Hazard, secretary, and Robert J. Ringwalt, treasurer, all of Philadelphia

New Construction :—

The new National Galvanizing plant at Versailles, Pa., is rapidly approaching completion and by Oct. 1 will be in operation. The entire machinery will be driven by electricity. The new mill will employ about 800 men.

The contract for the structural iron work of the main building of the McCool Tube Co., at Beaver Falls, Pa., has been awarded to Reeves & Son, of Pittsburg. The building is to 400 ft. long 40 ft. wide and two stories high. It will be of brick and iron.

The new plant of Hamilton Bros. & Co., near Latrobe, Pa., will consist of four large furnaces. The entire plant, including steel buildings, will cost $75,000.

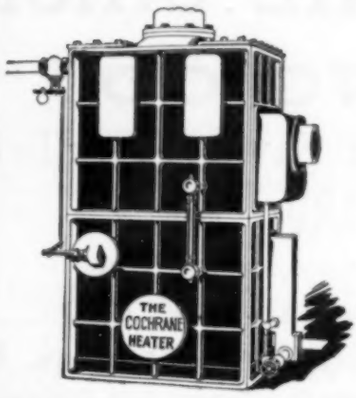
A company of Philadelphia capitalists has secured possession of a tract of five acres of land near Norristown, Pa. It is proposed to erect a plant in which to manufacture bicycle and other tubing. Chas. D. Cramp, of Philadelphia, is president of the new company.

At Morgantown, W. Va., a special session of the county courts has been convened to provide for new bridges where damage has been wrought by recent floods.

The county commissioners at Easton, Pa., rejected all bids for the iron bridge to be erected at Howells. New bids will be received till Aug. 15.

Work on the foundations for the new buildings of the Georgia Car & Mfg. Co., at Savannah, will be commenced soon.

Orland Smith, president of the Pittsburg & Connellsville Ry., has filed a petition in court at Baltimore asking that receivers' certificates aggregating $650,000 be authorized for



Don't stop buying coal—but don't buy so much.
Put some of your capital in a good feed-water heater.

THE COCHRANE HEATER

IS A DIVIDEND EARNER,

paying on its cost 100 to 500 per cent
per year, according to the conditions.

Have You a Place for One?

Harrison Safety Boiler Works,
PHILADELPHIA, PA.

Manufacturers of
THE COCHRANE HEATERS.
THE COCHRANE SEPARATORS.
THE WHARTON-HARRISON SAFETY BOILERS.

needed improvements. Of this amount $347,700 is desired for termianls at Pittsburg, $72,000 for a new yard at Connellsville and $12,500 for reservoirs.

The new plant of Griffiths, Scott & Co., at Washington, Pa., has been put in operation. It covers 192x280 feet and includes a main building 100x160 feet ; trimming house 50x80 feet and boiler room 40x42 feet.

The contract for the new bridge, to take the place of the railroad suspension bridge now spanning the Niagara river, has been awarded to the Pennsylvania Steel Co., Steelton, Pa. The new bridge will have a span of 550 ft. between piers, with short spans connecting the main span to the bluffs. It will have two floors, the upper one for two railroad tracks and the lower one for carriages, trolley cars and pedestrians. The piers will be of masonry built on the limestone about half-way up the sides of the bluff. The superstructure will require 2,780 tons of steel plates and angles, 109 tons of steel castings, 91 tons of steel I-beams and pins and 15 tons of iron rods and turnbuckles. The bridge is designed for a load on the railroad floor of two consolidation engines, with 40,000 lbs. on each pair of drivers, followed by a train of 3,500 lbs. per lineal feet, and at the same time the highway floor is to support a live load of 3,000 lbs. per ft.

Additions, Enlargements, Removals, Etc.:—

The plant of James Rees & Sons, of Pittsburg it is said will be removed to Freedom, Pa., where better water facilities can be had.

The Shoenberger Steel Co. is making a number of improvements to its plant including the addition of three 40-ton open-hearth steel furnaces.

Fires and Accidents:—

The foundry of the elevator works of Otis Bros. & Co., on Atherton st., Yonkers, N. Y., was burned on Aug. 1. The loss was about $20,000.

The iron foundry of Daniel Kelly, Portland, Me., was damaged by fire to the extent of $3,000.

The Lehigh Valley Coal & Iron Co.'s colliery breaker at Centralia, Pa., burned Saturday, with loss of $90,000.

General Industrial Notes:—

A strike started last week among the boys employed as rivet heaters at the Chicago Shipbuilding Co.'s yards. Work was suspended for several hours, but the trouble was finally settled and the strike declared off.

The large street car manufactory at Jewett, O., which went into the hands of a receiver a year ago, is closed down entirely. The original cost was $20,000, and a company of Pennsylvania capitalists has offered $6,000 for the plant.

As illustrating the light freight movement, no less than 1,800 cars are standing idle on the middle division of the Pennsylvania Railroad. The other divisions report a similar condition.

Miller Bros., of the Tradesmen's building, Pittsburg, completed some time ago the erection of a number of lap welding and bending furnaces for the Allison Mfg. Co., Philadelphia. A second order has now been placed with them by the same company.

Repairs at the plant of the Scottdale (Pa.) Iron & Steel Co., Ltd., have about been completed and the plant will resume soon.

H. K. Porter & Co., of Pittsburg, have orders on hand for several engines for foreign shipment. One goes to a Russian road, near St. Petersburg, others to San Salvador, Trinidad and Port au Prince, and two to gold mines near Johannesburg, South Africa.

The receivers of the American Tube & Iron Co., Middletown, Pa., have made their fourth payment on the company's indebtedness. All creditors whose claims were less than $300 have been paid in full, and interest at six per cent has been paid on all obligations up to the dates they were due.

The Clifton Iron Co., of Ironton, Ala., is pushing work on the furnace which it is changing from charcoal to coke. Its other stack will not be altered for the present, as the company has not yet decided to give up entirely the manufacture of charcoal iron.

At New Brighton, Pa., the Pierce-Cranch Engine Works started Aug. 3 to run night turn and increase its force accordingly. This was required in order to rush through motor carriages for exhibition at Eastern expositions.

The Ohio River Sheet & Tin Plate Co., a stock concern composed of Pittsburgers, some of them workmen, has started the new mill at Remington Station, Pa.

The employes of the Brown-Bonnell Iron Co., Youngstown, O., aided by the company, will organize an association and erect a building for club purposes and for intellectual and physical improvement.

A strike is on in the Bessemer limestone quarries against a 10 per cent reduction. The company's headquarters are at Youngstown, O. The closing down of the furnaces and the small market for product caused the reduction.

At Muncie, Ind., after several weeks' complete idleness, the mills of the Midland Steel Co., and the Indiana Iron Co. resumed operations Aug. 10. The puddling mill of the Indiana Iron Co. will work two turns a day. The nut and bolt works will not be started for some time yet.

The finishing department of the Oliver Iron & Steel Co.'s Southside mill, at Pittsburg, resumed Monday.

The Bridge and Structural Iron Workers' Union, at Chicago, will ask for an advance in wages next year, to go into effect May 1, 1897, providing for an increase of 3¾ cents an hour. At present the iron workers are receiving 41¼ cents an hour, having secured this rate after a week's strike, which began May 1 last. The new schedule also provides that all foremen shall be members of the union.

The Cambria Iron Co. has closed down its Atlas coke plant at Dunbar, Pa., consisting of 100 ovens and employing 125 men.

Representatives of the United States Car Co., of Anniston, Ala., were in Pittsburg last week securing workers for their 10-inch guide mill and 18-inch bar mill. The Amalgamated scale was not signed by the company and in consequence

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Proprietors of the CELEBRATED Mount Savage Fire Brick

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THE AMERICAN FIRE BRICK & CLAY CO., Mineral Point, Ohio.

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Ground or Calcined Clay in Sacks or Bulk.

"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

work was suspended. About 50 men were secured at Pittsburg.

At New Castle, Pa., the Raney & Berger furnace will go out of blast Aug. 15 for an indefinite time. The Shenango Valley Steel Co. will keep its furnace in operation through August, but will probably shut down in September. The Atlantic Iron & Steel Co.'s furnace is still going, and no plans have been made for shutting down.

The Youngstown Steel Co., Youngstown, O., will blow out its furnace this week, leaving only Brier Hill in blast in that district.

The Penn Steel Casting Co. has again broken the world's record in the casting of a 16-foot four-bladed propeller wheel for Roach's shipyard. The weight of the casting is 17,000 pounds.

Notices have been posted by the E. & G. Brooke Iron Co., of Birdsboro, Pa., of a reduction of 10 per cent in wages as soon as stack No. 3 goes into blast.

The Dillon-Griswold Wire Co., of Sterling, Ill., has completed and equipped its plant and is now producing wire nails, barbed wire, etc.

Sotter Bros.' Mechanics' Boiler Works, at Pottstown, Pa., has closed down, owing to dullness in trade, but may resume in a short time. This is the first time in many years that this plant has been closed.

The Tudor Iron Works of East St. Louis, have closed down for an indefinite period and 1,000 men are forced into idleness.

The Pittsburg, Shenango & Lake Erie Road is being thoroughly overhauled preparatory to handing the Butler & Pittsburg Road's traffic. Grades are being reduced, curves abandoned and in some places a new road bed constructed.

The hoop mill of J. Painter & Sons Co., Pittsburg, is again running after several weeks of idleness.

The Cumberland Tin Plate Co., of Cumberland, Md., will start up its black plate mill this week after a shut down of several weeks. The wage scale has been signed.

The furnace of the Spearman Iron Co., at Sharpsville, Pa., will probably blow in early in September.

It is announced that the New Castle Wire Nail Co. will resume about Aug. 20. The plant has been idle two months.

The Ohio River Sheet & Tin Plate Co. is operating the mill at Remington Station, Pa. Pittsburg capital is interested.

The basic steel plant of the Troy Steel Co., on Breaker Island, at Troy, N. Y., will begin steel making about Aug. 15. The blast furnaces have been running for some weeks. The

U. BAIRD MACHINERY CO.

PITTSBURG, PA.

Have a Special Lot of Second-Hand Tools. All in First-Class Condition.

1—55″ Allen Riveter.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
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1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

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Bright metal surfaces will rust over night, and will spoil if shipped any distance, unless coated with a reliable slushing compound. Many different articles are used to prevent rust, but most of them do not adhere to the metal, and rub off wherever handled; or they will stain the metal; or they contain or take up acids, and will not keep off rust for any length of time; or if they do adhere, it takes a great deal of time and labor to remove them.

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Phosphor Bronze ("Elephant Brand") Castings, Coolers, Tuyeres and Cinder Notches for Blast Furnaces supplied promptly.

Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

Agents for the CAMERON STEAM PUMP, which is made in every possible variety, and suitable for all purposes to which Steam Pumps can be applied.

Nos. 108 to 118 Third Avenue, PITTSBURGH, PA.

company began the rebuilding of the plant about a year ago and has erected seven large buildings. F. S. Witherbee is president, and George A. Bell general manager of the new company.

Work was temporarily suspended last week in the puddling department of the Sharon (Pa.) Iron Works owing to heat.

The contract recently awarded by the Georgia Railroad to the Ohio Falls Car Mfg. Co., at Jeffersonville, for the construction of 365 cars includes 200 ventilated box cars to cost $434 a car; 65 drop bottom gondolas to cost $340 a car; 50 platform cars to cost $286 each; and 10 stock cars to cost $414 each. The cars are to be paid for in 50 payments of $2,448.87 each, the first note becoming payable Sept. 15, 1896, the notes falling due monthly until Aug. 15, 1901. The total amount of the contract including interest on deferred payments, is $146,932.

At Elwood, Ind., at the conference between President Garland, the mill committee and the American Tin Plate Co., the men refused to accept the cut of 15 per cent. The company declared its inability to run unless the cut was accepted, and said it would start up with a non-union force within 10 days.

The Junction Iron & Steel Co.'s plant at Mingo Junction, O., closed down for a time on Aug. 8.

The Wheeling Iron & Steel Co. is making repairs. Heating furnaces are being rebuilt and engines are being overhauled.

At Chicago bids were opened last week for supplying the city with special castings for water pipes for the coming year. The contract was awarded to J. H. Bass at $38 per ton. The other bidders were Vierling-McDowell Co., at $40.80 per ton, and East Chicago Foundry Co., at $42 a ton.

Corrigan, McKinney & Co., Cleveland, do not expect to operate their furnaces in the Shenango valley for some time. The Scottdale Furnace is still going, but will be blown out as soon as the stock of ore is used up, which will probably be the latter part of August.

The Howe Pump & Engine Works, of Indianapolis, have gone into the hands of a receiver. The assets are $145,000 to $160,000, and the liabilities about $50,000. The company had built up a large business in the construction of water works, etc., and received in part payment municipal bonds. The securities were floated when cash was needed, but soon after the Chicago convention the company was notified that no more bonds could be cashed.

The Brown Hoisting & Conveying Machine Co., of Cleveland, has just received an order from Fried Krupp, at Essen, Germany, for a complete hoisting and conveying plant for their blast furnace at Rheinhausen. This plant consists of three standard Brown overhead bridge tramways, to be operated by electricity, each machine having independent winding drums and electric motors. The Brown Hoisting & Conveying Machine Co. is to furnish all the working parts, including the sheaves, engines, motors, hoisting and conveying machines, etc., in fact, everything but the bridges proper, which will be built in Germany, the Brown Co. sending a man abroad for that purpose. There will be three Elwell Parker motors used, of about 60 h. p. each. The entire plant is to be in operation early in 1897.

To Picturesque Mackinac via the Coast Line.

It only costs $13.50 from Detriot, $15.50 from Toledo, $18 from Cleveland for the round trip, including meals and berths. One thousand miles of lake ride on new modern steel steamers for the above rates. Send 2c. for illustrated pmaphlet. Address A. A. Schantz, G. P. A., Detroit, Mich.

Under the laws of Colorado the Duquesne Gold & Silver Mining & Milling Co. has been chartered with a capital of $1,000,000. Pittsburg capitalists are interested, the following being the officers: H. C. Frick, president; B. O. Little, vice-president; J. H. Schofield, secretary and I. R. Hedges, treasurer.

D. & C. Summer Service to Mackinac.

Their new steel passenger steamers are all in commission, making four trips per week between Teledo, Dertoit, Mackinac, Soo, Petoskey, Duluth. If you are contemplating a summer outing, send 2c. stamp for illustrated pamphlet. Address A. A. Schantz, G. P. A., Detroit, Mich.

The Navy Department has accepted the bid of the Midvale Steel Co., $240,000 for forgings for six-inch guns, and that of the Bethlehem Iron Co., $130,000, for forgings for four-inch and eight-inch guns. The average price is about 26 cents a pound.

Take Your Vacation Now.

Go to picturesque Mackinac Island via the D. & C. (Coast Line). It only costs $13.50 from Detroit, $15.50 from Toledo, $18 from Cleveland, for the round trip, including meals and berths. Tickets good for 60 days, bicycles carried free. One thousand miles of lake and river riding on new modern steel steamers for the above rates. Send 2c. for illustrated pamphlets. Address, A. A. Schantz, G. P. A., Detroit.

The Wellston Iron & Steel Co., Wellston, O., has purchased Milton Furnace, at that place, which has been idle for several years. The furnace will be thoroughly overhauled and remodeled and will be ready for blast about Sept. 15. It will have a daily capacity of from 100 to 110 tons.

Excursions to Omaha via Pennsylvania Lines.

Aug. 17 and 18 excursion tickets to Omaha will be sold via Pennsylvania Lines, for meeting of Y. P. C. U. of United Presbyterian Church; return coupons valid August 25, inclusive.

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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4,500	feet	new	8	inch	piping.
6,000	"	"	8	"	"
12,000	"	of	12	"	"
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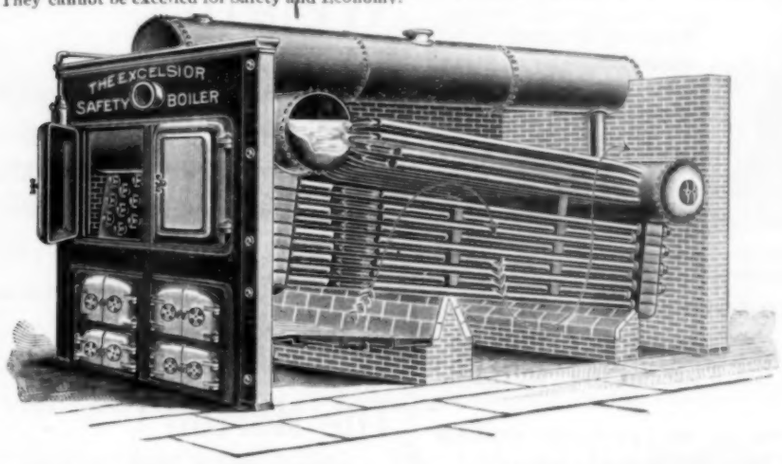
They cannot be excelled for Safety and Economy.



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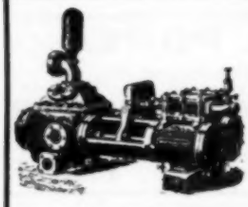

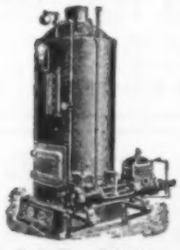

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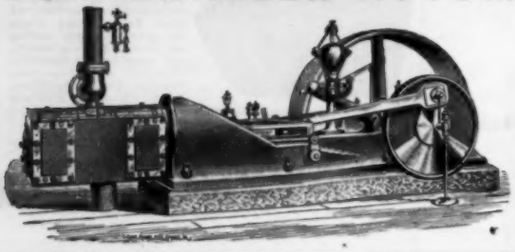

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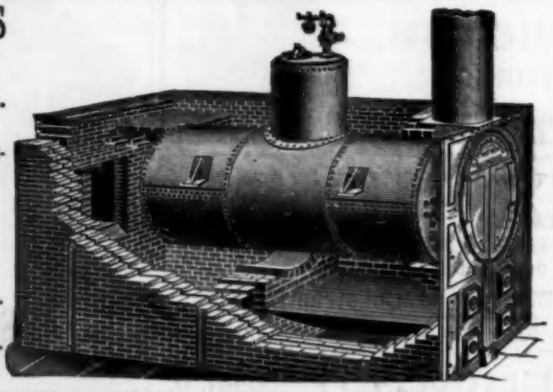

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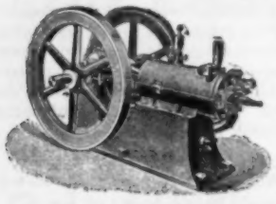

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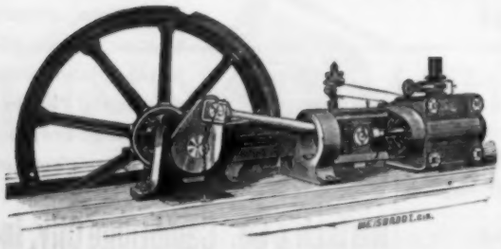

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Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
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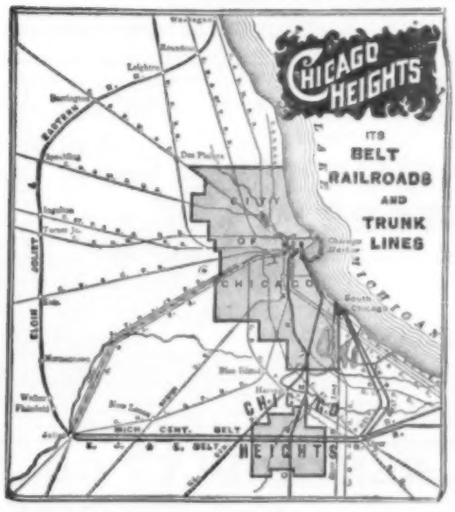

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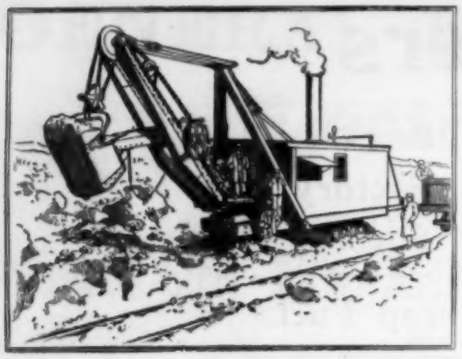

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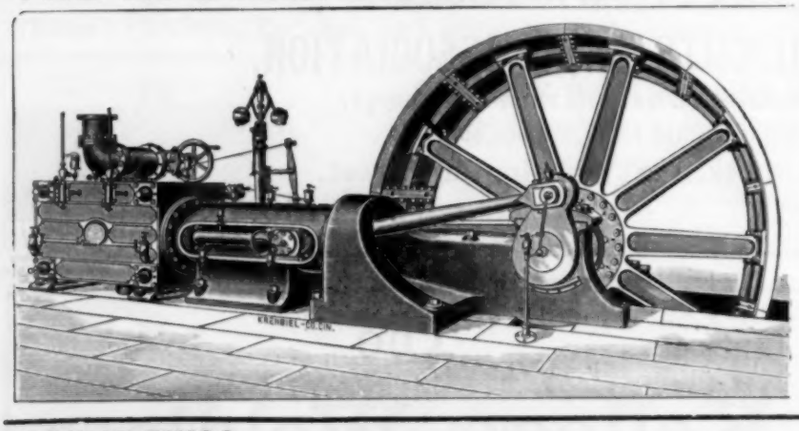

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Sample piece of FLUE taken from Locomotive No. 725 running for 7 months on Western Division of N. Y. C. & H. R. R. R. showing amount of SCALE adhering in that time.

If you desire further information, send for our circular which goes into the subject with cogent reasoning, as well as scientifically, corroborated by testimonials, any of which would convince a practical mechanic, but as "seeing is believing," send in your orders and save time, trouble and money by commencing the use of this known valuable **COMPOUND** at once. Canned in five-pound tins and packed in 100-pound cases, for Land Boilers, price $20 per case. Canned in one-pound tins and packed in 50-pound cases, for Locomotive Boilers price $25 per case.

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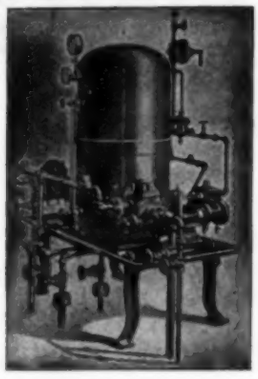

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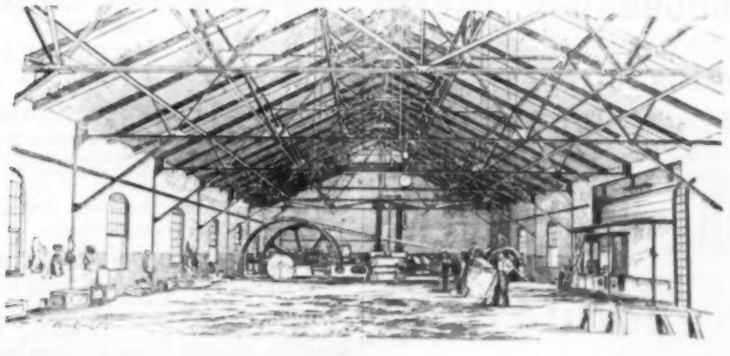

The above illustration is taken direct from a photograph and shows the interior of an engine room or Power House, which was designed and built by us for the Scranton Traction Co., at Scranton, Penn. The building is 60 feet wide and 120 feet long, the frame work being entirely of steel. Between the steel side posts is placed a light brick wall to protect the interior from the weather and ventilation is secured by a monitor the full length of the building, with swinging sash on the sides. The roof is covered with slate secured to the roof plank.

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RECEIVERS' SALE.

THE SWANZY MINE OF THE ESCANABA RIVER LAND & IRON CO. FOR SALE.

TAKE NOTICE.

Whereas under and by virtue of an order of sale made by the Circuit Court for the county of Marquette, in Chancery, on the 12th day of March, A. D., 1896, in the cause then pending in said court wherein the Anthony Powder Company (Limited) is complainant and the Escanaba River Land & Iron Company is defendant, the receiver of all and singular the property of said Escanaba River Land & Iron Company theretofore appointed by said court to have and receive all the property of said company and abide the further order of said court was duly authorized and empowered to sell the mine, mine plant and real estate of said company situated in the township of Forsyth, in the county of Marquette and State of Michigan, on certain terms and conditions in said order set forth for the purpose of paying the debts of said corporation mentioned in said order together with the costs and expenses of such sale and of the said receiver subject to the approval of said court.

NOW THEREFORE, in pursuance with said order and for the purpose mentioned therein, I, Thomas M. Wells, the receiver mentioned in said order, hereby offer for sale, and will sell at public vendue upon proper and sufficient bid or bids received therefor, either for cash or on satisfactory terms of sale, such as may be approved by the Court, the following described real estate, mine and mining plant of said Escanaba River Land & Iron Company, to-wit: The southeast fractional quarter of section eighteen (18) in township forty-five (45), north of Range twenty-five (25), west in the county of Marquette and State of Michigan, the same being the Swanzy mine, so-called, together with the machinery, boilers, pumps, engines and all connections, pipes, fixings, fixtures and appurtenances and all tracks, tools, appliances and structures of every kind, constituting the mine plant located on said above described land; also all materials and supplies on hand, consisting of fuel and other property required for use in operating the mine which may be on hand at the time of said sale, said materials or supplies to be sold as such as personal property on the premises, but said mining machinery, pumps and engines and all other property constituting the plant for operating the mine on the premises to be sold as part and parcel thereof in one lump with the land above described, such sale or offer of sale to take place and be made at the front door of the court house in the City of Marquette, in said County and State, on Friday, the twenty-fourth day of July, 1896, at twelve (12) o'clock noon of said day.

The sale of said material and supplies being personal property, shall take place on the premises at the mine location of said Escanaba River Land & Iron Company, in the township of Forsyth, Marquette County, Michigan, on Saturday, the twenty-fifth day of July, A. D., 1896, at the hour of twelve (12) o'clock noon of said day

The mining plant aforesaid consists of the following: Two 5 ft. by 16 ft. boilers; one 10x16 duplex hoisting engine; two four-foot hoisting drums; one air-compressor; three power drills; one No. 10 Cameron pump, two No. 7 Knowles pumps; two 1 and ½ ton skips; together with all connections, pipes, fittings, wire rope, and all shaft houses, buildings, dwellings, and all structures of every kind and description, and all other property of every kind constituting the mining plant on said premises.

Specifications and descriptions of the materials and supplies on hand at the time of such sale will be furnished bidders for inspection at the front door of the court house in the city of Marquette at twelve (12) o'clock noon on the twenty-fourth day of July, A. D., 1896, at the time of offer of sale of said mine and plant.

The receiver at such sale reserves the right to require a deposit of five thousand dollars to be made by the successful bidder at the time of such sale to remain on deposit with said receiver pending the final confirmation of such sale by the Court the same to apply on the purchase price in case of confirmation of sale and to be returned to the bidder in case of rejection of said bid.

Dated Negaunee, Mich., June 5th, 1896.

T. M. WELLS Receiver Escanaba River Land & Iron Co.

The above advertised sale is adjourned to Wednesday August 26th at same hour and place.

THOMAS M. WELLS, Receiver.

R. D. NUTTALL CO.,

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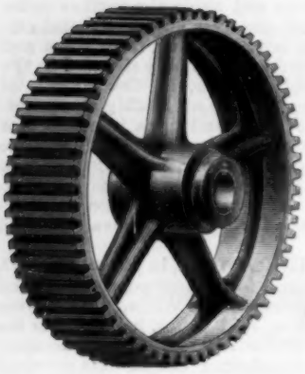

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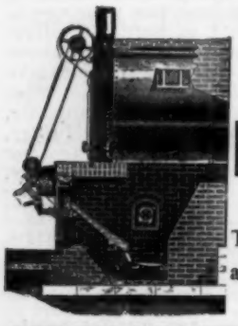

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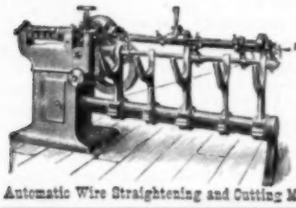

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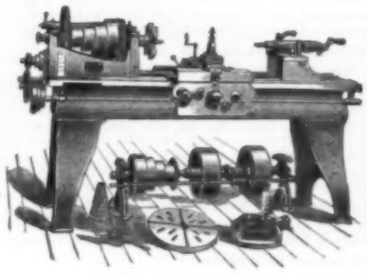

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Lodge & Shipley Machine Tool Co., Cincinnati
C. H. Haeseler & Co., Philadelphia, Pa.
Springfield Machine Tool Co., Springfield, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O
Springfield Machine Tool Co., Springfield, O.
Atwood & M'Caffrey, Pittsburg, Pa.
The R. D. Nuttall Co., Allegheny, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metallic Lath—
The Cincinnati Corrugating Co., Piqua, O.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Link-Belt Machinery Co., Chicago, Ill.
Earle C. Bacon, New York City.
Fraser & Chalmers, Chicago.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Newport Sand Bank Co., Newport, Ky.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York City.

Pattern Leather Fillet—
Canton Leather Fillet Co., Canton, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Pipe—
F. K. Bowes, Chicago, Ill.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

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C. H. Besly & Co., Chicago, Ill.

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C. H. Haeseler & Co., Philadelphia, Pa.

Power Presses—
Springfield Machine Tool Co., Springfield, O.

Portable Forges—
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Cady Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

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Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
Link-Belt Machinery Co., Chicago, Ill.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Atwood & M'Caffrey, Pittsburg, Pa.
Henry R. Worthington, Brooklyn, N. Y.
Fraser & Chalmers, Chicago.

Pyrometers—
Edward Brown, Philadelphia, Pa.

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F. K. Bowes, Chicago, Ill.

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Cleveland City Forge & Iron Co., Cleveland.

Retort Coke Ovens—
Semet-Solvay Co., Syracuse, N. Y.

Rock Drills—
Rand Drill Co., Chicago, Ill.

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The Lloyd-Booth Co., Youngstown, O.

Rolling Mill Supplies—
Atwood & M'Caffrey, Pittsburg, Pa

Rolls—
Samuel Tretheway & Co., Pittsburg, Pa.

Roofs—
Berlin Iron Bridge Co., East Berlin, Conn.
The Cincinnati Corrugating Co., Piqua, O.
Shiffler Bridge Co., Pittsburg.

Roofing Plates—
Morton Tin Plate Co., Cambridge, O.
The Cincinnati Corrugating Co., Piqua, O.

Rust Preventatives—
Otto Goetze, New York City.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Saws—
Peter Gerlach & Co., Cleveland.

Schools—
International Correspondence Schools, Scranton, Pa.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

Semi-Steel—
McDowell Steel Co., Chicago, Ill.

Shapers—
Springfield Machine Tool Co., Springfield, O.

Shafting—
Finished Steel Co., Youngstown, O.

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Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co. Piqua, O.

Smoke Consumers—
American Smokeless Furnace Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Special Machinery—
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Cady Mfg. Co., Cleveland, O
Edwin Harrington Son & Co., Philadelphia.

Skylights—
Translucent Fabric Co., Quincy, Mass.

Stamping and Punching—
Cady Mfg. Co., Cleveland, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O
Marion Steam Shovel Co., Marion, O.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
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McDowell Steel Co., Chicago, Ill.
The Sargent Co., Chicago, Ill.

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Samuel Tretheway & Co., Pittsburg, Pa.

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Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Steel Shafting—
Finished Steel Co., Youngstown, O

Steel Tanks—
Berlin Iron Bridge Co., East Berlin, Conn.

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Playford Stoker Co., Cleveland, O.
American Smokeless Furnace Co., Cleveland, O
Brightman Furnace Co., Cleveland, O.

Structural Engineers—
Berlin Iron Bridge Co., East Berlin, Conn.

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Central Iron & Steel Co., Brazil, Ind.

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Enterprise Boiler Co., Youngstown, O.

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Universal Telephone Co., Indianapolis, Ind.

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Ætna-Standard Iron & Steel Co., Bridgeport, O
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C. H. Besly & Co., Chicago, Ill.

Valves—
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Jenkins Bros., New York City.

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American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
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Salem Wire Nail Co., Salem, O.

Wire Rope—
American Hoist & Derrick Co., St.
Roberts Steel Chain Belting Co., Pittsburg

Wire Machinery—
Cady Mfg. Co., Cleveland, O.
John Adt & Son, New Haven Conn.

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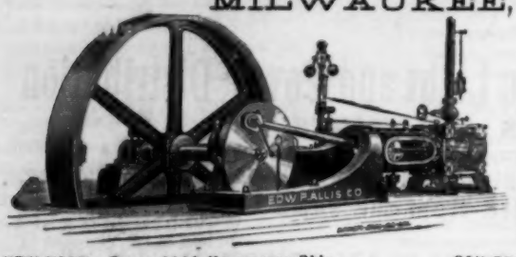

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PITTSBURG, 702 German National Bank Bldg.
SALT LAKE CITY, Desert Bank Bldg.
KANSAS CITY, Armour Bldg.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@4.75
No. 1 Bessemer hematite	4.00@4.25
Hematites No. 1 non-Bessemer	2.25@2.50
No 1. Specular, non-Bessemer	2.75@3.00

PIG IRON.

CLEVELAND (f. o. b. cars):

Bessemer	$12 25@12 40
No. 1 Strong Foundry	12 00@12 25
No. 2 Strong Foundry	11 50@11 75
No. 1 Gray Forge, red short	10 15@10 40
No. 2 Gray Forge, neutral	10 00
No. 1 American Scotch	12 50
No. 2 American Scotch	11 75
Lake Superior Charcoal	13 50

PITTSBURG:

No. 1 Foundry	$12 00@12 25
No. 2 Foundry	11 50@11 75
Gray Forge	10 25@10 50
White and Mottled	10 00
Warm Blast Charcoal	15 00@16 00
Cold Blast Charcoal	20 00
Bessemer	12 25

CHICAGO:

Lake Superior Charcoal	$13 50@14 00
Local Coke Foundry No. 1	12 00@12 50
Local Coke Foundry No. 2	11 50@12 00
Local Coke Foundry No. 3	11 00@11 50
Local Scotch Foundry No. 1	12 00@12 50
Local Scotch Foundry No. 2	11 50@12 00
Local Scotch Foundry No. 3	11 00@11 50
Southern Coke No. 1	12 10@12 35
Southern Coke No. 2	11 60@11 85
Southern Coke No. 3	11 10@11 60
Southern No. 1 Soft	11 60@11 85
Southern No. 2 Soft	11 35@11 50
Southern Silveries No. 1	11 85@12 35
Southern Silveries No. 2	11 60@11 85
Jackson Co. Silveries	14 50@16 00
Ohio Silveries No. 1	15 00@15 50
Ohio Silveries No. 2	14 50@15 00
Ohio Strong Softeners	15 00@15 50
Alabama Car Wheel	16 85@17 35
Malleable Bessemer	13 00@13 50
Coke Bessemer	13 00@13 50

CINCINNATI (reported by Rogers, Brown & Co.)

Southern Coke No. 1, Foundry	$11 00
Southern Coke No. 2 and No. 1 Soft	10 50
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@17 00
Tennessee Charcoal No 1	13 00@14 00
Jackson County Silvery No 1	14 00@14 50
Southern Coke, Gray Forge	9 50
" " Mottled	9 50
Standard Alabama Car Wheel	15 00@16 00
Tennessee " "	14 00@15 00
Lake Superior " "	15 25@15 50

BUFFALO:

No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 00@13 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	12 50@12 75
Ohio Strong Softener No. 1	13 00@13 50
Jackson Co. Silvery No. 1	15 25@15 50
Lake Superior Charcoal	13 50@14 00
Southern Soft No. 1	12 15
Hanging Rock Charcoal	17 00

ST. LOUIS (reported by Rogers, Brown & Meacham):

Southern Coke No 1	$11 50
Southern Coke No. 2	11 00
Southern Coke No. 3	10 50
Southern Gray Forge	10 00
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@15 00
Ohio Softeners	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

OLD RAILS AND SCRAP METAL.

	GROSS TONS
Old iron rails	$15 00
Old steel rails	12 00
Old car wheels	12 50
	NET TONS
No. 1 R. R. wrought scrap	$11 00
Mill scrap	9 50
No. 1 Machine cast scrap	9 00
Iron axles	16 00
Axle turnings	6 50
Wrought turnings (free from cast)	7 50
Cast borings	6 50
Uncut wrought iron boilers	4 00
Steel boiler plates	10 00
Grate bars	6 75
Pipes and flues (clean)	9 00
Tank iron	9 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.65c
Angles	1.29c
Tees	1.50c
Universal Plates	1.30@1.35c
Sheared Plates	1.40c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 30
4½ to 6 by ⅜ to 1 inch	1 35
1½ to 6 by 1⅛ to 2 inch	1 35
1¼ & 1⅜ by ⅜ to ¾ inch	1 20
1 & 1⅛ by ⅜ to ¾ inch	1 20
⅝, ⅞, ⅛, by ⅜ to ¼ inch	1 20

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Geo. H. Bowler, Sec'y and Treas

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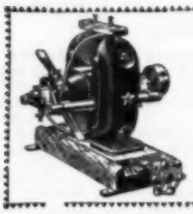

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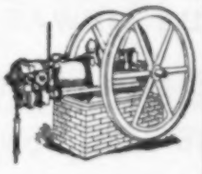

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And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

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FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 10
2 to 2⅞ inch	1 30
2⅞ to 3¼ inch	1 25
3⅜ to 4 inch	1 60
4¼ to 4⅝ inch	2 20
4⅝ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅜ to ¾ inch	1 30
½	1 50
⅝	1 50
¾	1 70

Half Oval and Half Round.

1¼ to 3 inch	1 65
⅜ to 1½ inch	1 45
⅜ to ¾ inch	1 70
½	1 85
¾	2 90

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 20
1 to 1¾ by ⅜ and 5-16 inch	1 25
¾ to ⅞ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 35
1 7-16 to 2, No. 17, 18 and 19	1 40
1 7-16 to 2, No. 20	1 50
1 7-16 to 2, No. 21	1 60
1 7-16 to 2, No. 22	1 70
1⅛ to 1⅜, No. 13, 14 and 15	1 40
1⅛ to 1⅜, No. 16, 17 and 18	1 45
1⅛ to 1⅜, No 19 and 20	1 50
1⅛ to 1⅜, No. 21	1 60
1⅛ to 1⅜, No. 22	1 70
15-16 and 1 inch, No. 13, 14 and 15	1 35
15-16 and 1 inch, No. 16, 17 and 18	1 50
15-16 and 1 inch, No. 19 and 20	1 60
15-16 and 1 inch, No. 21	1 70
15-16 and 1 inch, No. 22	1 80
⅞, No. 13, 14 and 15	1 60
⅞, No. 16, 17 and 18	1 70
⅞, No. 19 and 20	1 80
⅞, No. 21	1 90
⅞, No. 22	2 00
13-16, No. 13, 14 and 15	1 70
13-16, No. 16, 17 and 18	1 80
13-16, No. 19 and 20	1 90
13-16, No. 21	2 00
13-16, No. 22	2 10
¾, No. 13, 14 and 15	1 80
¾, No. 16, 17 and 18	1 95
¾, No. 19 and 20	2 05
¾, No. 21	2 15
¾, No. 22	2 25
11-16, No. 13, 14 and 15	2 05
11-16, No. 16, 17 and 18	2 10
11-16, No. 19 and 20	2 20
11-16, No. 21	2 30
11-16, No. 22	2 40
11-16, No. 23	2 50
⅝, No. 13, and 15	2 10
⅝, No. 16, 17 and 18	2 20
⅝, No. 19 and 20	2 30
⅝, No. 21	2 40
⅝, No. 22	2 50
⅝, No. 23	2 60
9-16, No. 13, 14 and 15	2 30
9-16, No. 16, 17 and 18	2 40
9-16, No. and 20	2 50
9-16, No. and	1 60
9-16, No. 221	2 70
9-16, No. 22	1 80
7-16 and ½ inch, No. 13, 14 and 15	3 50
7-16 and ½ inch, No. 16, 17 and 18	2 60
7-16 and ½ inch, No. 19 and 20	2 70
7-16 and ½ inch, No. 21	2 80
7-16 and ½ inch, No. 22	2 90
7-16 and ½ inch, No. 23	3 00
½, No. 13, 14 and 15	3 00
½, No. 16, 17 and 18	3 10
½, No. 19 and 20	3 20
½, No. 21	3 30
½, No. 22	4 50
½, No. 23	3 60

Light Band.

1⅜ to 6 by ⅛ to 3-16 inch	1 60
1⅜ to 6 by Nos. 11 and 12	1 65
1 to 1¾ by ⅛ to 3-16 inch	1 65
1 to 1¾ by Nos. 11 and 12	1
⅝ and 13-16 by ⅛ to 3-16 inch	1
⅝ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅝ and 9-16 by ⅛ to 3-16 inch	2 05
⅝ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅝ inch, beveled edge, by Nos. 11 and 12	1 50
⅝ inch, " " " " 13 and 14	1 60
¾ inch, " " " " 11 and 12	1 65
¾ inch, " " " " 13 and 14	1 75

Sheet Iron.

No. 10	1 45
No. 12	1 55
No. 14	1 65
No. 15-17	1 65
No. 18	1 75
No. 20	1 90
No. 22-24	2 05
No. 25-26	2 15
No. 27	2 35

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1¼c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

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BLACK PLATES,

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Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

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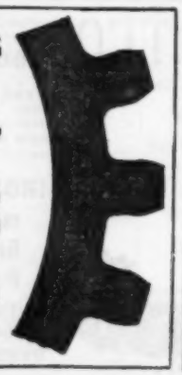

7-16 to ⅜ and 2¾ to 3 in.	.09
3½ to 4 in.	.09½
⅝ to 11-16 and 4½	.10
⅝ to 6 in.	.10¼
¾ to 9-32 and 6¼ to 7 in.	.11
7 to in	.13

Flats.

	cts. lbs
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 50
Open-hearth Spring	"	1 70
Sleigh Shoe	"	1 55
Toe Calk	"	1 65
Cutter Shoes, tapered and bent	"	1 70

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15¾c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 52½
Butt " " "	dis. 50
Boiler tubes 2½" and smaller	dis. 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 60&10
Morse Taper and Straight Shank to 1½"	dis 60&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

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	No. 4 to No. 54 46 gr.	No. 54 to Flour 150 gr.	C. F. F.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

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Barder, Adamson & Co.....dis 50@50&5
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Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@75
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 60@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....12c
" " " over 5 lbs.....10c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	⅞	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛	
Hexagon	15⅜	11⅝	8½	6	5⅛	5⅛		
Washers	9	8	7	5	4½	4½	4⅛	

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg card rate
Car lots.....$2.15
Less than car lots.....$2.65

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10&10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 50
Medart Pulleys.....dis 50
Split Wood Pulleys.....dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block.....dis 20

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 4c
Copper.....dis 4c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75&10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

Wrenches.

Coe's genuine.....dis 50
Girard Standard.....dis 70&15
Agricultural.....dis 75&15
Mechanic's.....dis 55&10&5
Bemis & Call's Combination.....dis 30
Donohue's Engineers.....dis 20&15
Lamson & Sessions Engineers.....dis 65
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 20
Alligator " " .....dis 40

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BRONZE SCREEN PLATES To withstand action of ACIDULATED WATERS.

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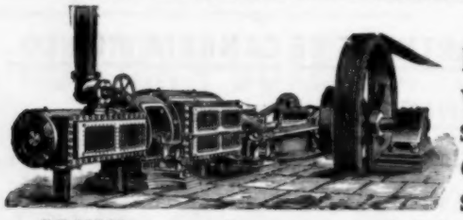

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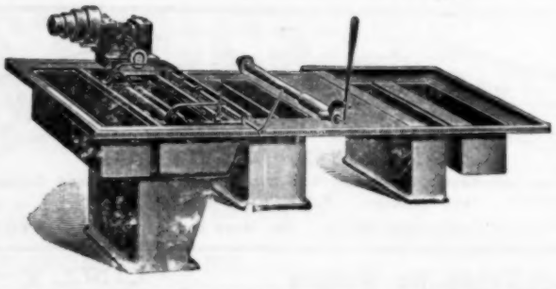

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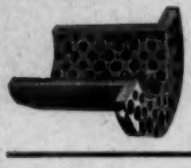

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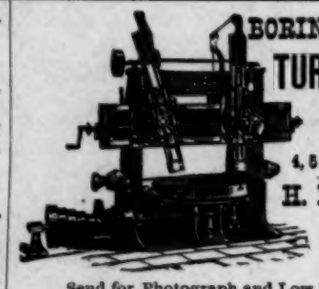

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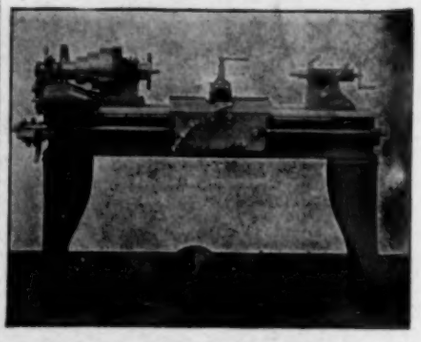

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